THERMAL ARC®

95 S

THERMAL ARC®

INVERTER ARC WELDER

Art # A-09694

Operating Manual

Intertek
4000995

Revision: AA Issue Date: November 1, 2010 Manual No.: 0-5175

Operating Features:

SMAW | GTAW | 95 AMP | CC | DC | 115 V | 1 PHASE | 60 Hz | INVERTER

WE APPRECIATE YOUR BUSINESS!

Congratulations on your new Thermal Arc product. We are proud to have you as our customer and will strive to provide you with the best service and reliability in the industry. This product is backed by our extensive warranty and world-wide service network. To locate your nearest distributor or service agency call 1-905-827-4515, or visit us on the web at **www.Thermalarc.com.**

This Operating Manual has been designed to instruct you on the correct use and operation of your Thermal Arc product. Your satisfaction with this product and its safe operation is our ultimate concern. Therefore please take the time to read the entire manual, especially the Safety Precautions. They will help you to avoid potential hazards that may exist when working with this product.

YOU ARE IN GOOD COMPANY!

The Brand of Choice for Contractors and Fabricators Worldwide.

Thermal Arc is a Global Brand of Arc Welding Products for Thermadyne Industries Inc. We manufacture and supply to major welding industry sectors worldwide including; Manufacturing, Construction, Mining, Automotive, Aerospace, Engineering, Rural and DIY/Hobbyist.

We distinguish ourselves from our competition through market-leading, dependable products that have stood the test of time. We pride ourselves on technical innovation, competitive prices, excellent delivery, superior customer service and technical support, together with excellence in sales and marketing expertise.

Above all, we are committed to develop technologically advanced products to achieve a safer working environment within the welding industry.

WARNINGS

Read and understand this entire Manual and your employer's safety practices before installing, operating, or servicing the equipment.

While the information contained in this Manual represents the Manufacturer's best judgement, the Manufacturer assumes no liability for its use.

Operating Manual Number 0-5175 for:

Thermal Arc 95 S Power Source Arc Welder	Part No. W1003206
Thermal Arc 95 S System with Stick Kit & Case	Part No. W1003209
Thermal Arc 95 S System with Stick/TIG Kit & Case	Part No. W1003210

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Record the following information for Warranty purposes:

Where Purchased: _____

Purchase Date: _____

Equipment Serial #: _____

TABLE OF CONTENTS

TABLE OF CONTENTS

SECTION 1:
SAFETY INSTRUCTIONS AND WARNINGS

WARNING

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS KEEP AWAY UNTIL CONSULTING YOUR DOCTOR. DO NOT LOSE THESE INSTRUCTIONS. READ OPERATING/INSTRUCTION MANUAL BEFORE INSTALLING, OPERATING OR SERVICING THIS EQUIPMENT.

Welding products and welding processes can cause serious injury or death, or damage to other equipment or property, if the operator does not strictly observe all safety rules and take precautionary actions.

Safe practices have developed from past experience in the use of welding and cutting. These practices must be learned through study and training before using this equipment. Some of these practices apply to equipment connected to power lines; other practices apply to engine driven equipment. Anyone not having extensive training in welding and cutting practices should not attempt to weld.

Safe practices are outlined in the American National Standard Z49.1 entitled: SAFETY IN WELDING AND CUTTING. This publication and other guides to what you should learn before operating this equipment are listed at the end of these safety precautions. **HAVE ALL INSTALLATION, OPERATION, MAINTENANCE, AND REPAIR WORK PERFORMED ONLY BY QUALIFIED PEOPLE.**

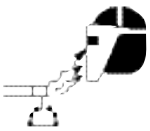
1.01 Arc Welding Hazards

WARNING

ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semi-automatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

1. Do not touch live electrical parts.
2. Wear dry, hole-free insulating gloves and body protection.
3. Insulate yourself from work and ground using dry insulating mats or covers.
4. Disconnect input power or stop engine before installing or servicing this equipment. Lock input power disconnect switch open, or remove line fuses so power cannot be turned on accidentally.
5. Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
6. Turn off all equipment when not in use. Disconnect power to equipment if it will be left unattended or out of service.
7. Use fully insulated electrode holders. Never dip holder in water to cool it or lay it down on the ground or the work surface. Do not touch holders connected to two welding machines at the same time or touch other people with the holder or electrode.
8. Do not use worn, damaged, undersized, or poorly spliced cables.
9. Do not wrap cables around your body.
10. Ground the workpiece to a good electrical (earth) ground.
11. Do not touch electrode while in contact with the work (ground) circuit.
12. Use only well-maintained equipment. Repair or replace damaged parts at once.
13. In confined spaces or damp locations, do not use a welder with AC output unless it is equipped with a voltage reducer. Use equipment with DC output.
14. Wear a safety harness to prevent falling if working above floor level.
15. Keep all panels and covers securely in place.



WARNING

ARC RAYS can burn eyes and skin; NOISE can damage hearing. Arc rays from the welding process produce intense heat and strong ultraviolet rays that can burn eyes and skin. Noise from some processes can damage hearing.

1. Wear a welding helmet fitted with a proper shade of filter (see ANSI Z49.1 listed in Safety Standards) to protect your face and eyes when welding or watching.
2. Wear approved safety glasses. Side shields recommended.
3. Use protective screens or barriers to protect others from flash and glare; warn others not to watch the arc.
4. Wear protective clothing made from durable, flame-resistant material (wool and leather) and foot protection.
5. Use approved ear plugs or ear muffs if noise level is high.

WARNING

FUMES AND GASES can be hazardous to your health.

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

1. Keep your head out of the fumes. Do not breathe the fumes.
2. If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
3. If ventilation is poor, use an approved air-supplied respirator.
4. Read the Material Safety Data Sheets (MSDSs) and the manufacturer's instruction for metals, consumables, coatings, and cleaners.
5. Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Shielding gases used for welding can displace air causing injury or death. Be sure the breathing air is safe.
6. Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
7. Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and if necessary, while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

WARNING

WELDING can cause fire or explosion.

Sparks and spatter fly off from the welding arc. The flying sparks and hot metal, weld spatter, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode or welding wire to metal objects can cause sparks, overheating, or fire.

1. Protect yourself and others from flying sparks and hot metal.
2. Do not weld where flying sparks can strike flammable material.
3. Remove all flammables within 35 ft. (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
4. Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
5. Watch for fire, and keep a fire extinguisher nearby.
6. Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
7. Do not weld on closed containers such as tanks or drums.
8. Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock and fire hazards.
9. Do not use welder to thaw frozen pipes.
10. Remove stick electrode from holder or cut off welding wire at contact tip when not in use.

Eye protection filter shade selector for welding or cutting (goggles or helmet), from AWS A6.2-73.

Welding or Cutting Operation	*Electrode Size Metal Thickness or Welding Current*	*Filter Shade No.*	*Welding or Cutting Operation*	*Electrode Size Metal Thickness or Welding*	*Filter Shade No.*
Torch soldering		2	**Gas metal-arc welding (MIG)**		
Torch brazing		3 or 4	Non-ferrous base metal	All	11
Oxygen Cutting			Non-ferrous base metal	All	12
Light	Under 1 in., 25 mm	3 or 4	Gas tungsten arc welding	All	12
Medium	1 to 6 in., 25-150 mm	4 or 5	(TIG)	All	12
Heavy	Over 6 in., 150 mm	5 or 6	Atomic hydrogen welding	All	12
Gas welding			Carbon arc welding	All	12
Light	Under 1/8 in., 3 mm	4 or 5	Plasma arc welding		
Medium	1/8 to 1/2 in., 3-12 mm	5 or 6	**Carbon arc air gouging**		
Heavy	Over 1/2 in., 12 mm	6 or 8	Light		12
Shielded metal-arc welding (stick) electrodes	Under 5/32 in., 4 mm	10	Heavy		14
	5/32 to 1/4 in., 4 to 6.4 mm	12	**Plasma arc cutting**		
	Over 1/4 in., 6.4 mm	14	Light	Under 300 Amp	9
			Medium	300 to 400 Amp	12
			Heavy	Over 400 Amp	14

WARNING

FLYING SPARKS AND HOT METAL can cause injury.

Chipping and grinding cause flying metal. As welds cool, they can throw off slag.

1. Wear approved face shield or safety goggles. Side shields recommended.
2. Wear proper body protection to protect skin.

WARNING

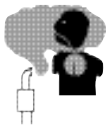
CYLINDERS can explode if damaged.

Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

1. Protect compressed gas cylinders from excessive heat, mechanical shocks, and arcs.
2. Install and secure cylinders in an upright position by chaining them to a stationary support or equipment cylinder rack to prevent falling or tipping.
3. Keep cylinders away from any welding or other electrical circuits.
4. Never allow a welding electrode to touch any cylinder.
5. Use only correct shielding gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
6. Turn face away from valve outlet when opening cylinder valve.
7. Keep protective cap in place over valve except when cylinder is in use or connected for use.
8. Read and follow instructions on compressed gas cylinders, associated equipment, and CGA publication P-1 listed in Safety Standards.

WARNING

Engines can be dangerous.



WARNING

ENGINE EXHAUST GASES can kill.

Engines produce harmful exhaust gases.

1. Use equipment outside in open, well-ventilated areas.
2. If used in a closed area, vent engine exhaust outside and away from any building air intakes.

WARNING

ENGINE FUEL can cause fire or explosion.

Engine fuel is highly flammable.

1. Stop engine before checking or adding fuel.
2. Do not add fuel while smoking or if unit is near any sparks or open flames.
3. Allow engine to cool before fueling. If possible, check and add fuel to cold engine before beginning job.
4. Do not overfill tank — allow room for fuel to expand.
5. Do not spill fuel. If fuel is spilled, clean up before starting engine.

WARNING

MOVING PARTS can cause injury.

Moving parts, such as fans, rotors, and belts can cut fingers and hands and catch loose clothing.

1. Keep all doors, panels, covers, and guards closed and securely in place.
2. Stop engine before installing or connecting unit.
3. Have only qualified people remove guards or covers for maintenance and troubleshooting as necessary.
4. To prevent accidental starting during servicing, disconnect negative (-) battery cable from battery.
5. Keep hands, hair, loose clothing, and tools away from moving parts.
6. Reinstall panels or guards and close doors when servicing is finished and before starting engine.

WARNING

SPARKS can cause BATTERY GASES TO EXPLODE; BATTERY ACID can burn eyes and skin.

Batteries contain acid and generate explosive gases.

1. Always wear a face shield when working on a battery.
2. Stop engine before disconnecting or connecting battery cables.
3. Do not allow tools to cause sparks when working on a battery.
4. Do not use welder to charge batteries or jump start vehicles.
5. Observe correct polarity (+ and –) on batteries.

WARNING

STEAM AND PRESSURIZED HOT COOLANT can burn face, eyes, and skin.

The coolant in the radiator can be very hot and under pressure.

1. Do not remove radiator cap when engine is hot. Allow engine to cool.
2. Wear gloves and put a rag over cap area when removing cap.
3. Allow pressure to escape before completely removing cap.

LEAD WARNING

This product contains chemicals, including lead, or otherwise produces chemicals known to the State of California to cause cancer, birth defects and other reproductive harm. Wash hands after handling. (California Health & Safety Code § 25249.5 et seq.)

NOTE

Considerations About Welding And The Effects of Low Frequency Electric and Magnetic Fields

The following is a quotation from the General Conclusions Section of the U.S. Congress, Office of Technology Assessment, Biological Effects of Power Frequency Electric & Magnetic Fields - Background Paper, OTA-BP-E-63 (Washington, DC: U.S. Government Printing Office, May 1989): "...there is now a very large volume of scientific findings based on experiments at the cellular level and from studies with animals and people which clearly establish that low frequency magnetic fields interact with, and produce changes in, biological systems. While most of this work is of very high quality, the results are complex. Current scientific understanding does not yet allow us to interpret the evidence in a single coherent framework. Even more frustrating, it does not yet allow us to draw definite conclusions about questions of possible risk or to offer clear science-based advice on strategies to minimize or avoid potential risks."

To reduce magnetic fields in the workplace, use the following procedures.

1. Keep cables close together by twisting or taping them.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cable around the body.
4. Keep welding power source and cables as far away from body as practical.

ABOUT PACEMAKERS:

The above procedures are among those also normally recommended for pacemaker wearers. Consult your doctor for complete information.

1.02 Principal Safety Standards

Safety in Welding and Cutting, ANSI Standard Z49.1, from American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126.

Safety and Health Standards, OSHA 29 CFR 1910, from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, American Welding Society Standard AWS F4.1, from American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126.

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

Code for Safety in Welding and Cutting, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.

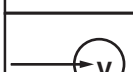
Safe Practices for Occupation and Educational Eye and Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 1430 Broadway, New York, NY 10018.

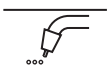
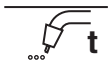
Cutting and Welding Processes, NFPA Standard 51B, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

1.03 Symbol Chart

Note that only some of these symbols will appear on your model.

	On
	Off
	Dangerous Voltage
	Increase/Decrease
	Circuit Breaker
	AC Auxiliary Power
	Fuse
A	Amperage
V	Voltage
Hz	Hertz (cycles/sec)
f	Frequency
—	Negative
+	Positive
⎓	Direct Current (DC)
	Protective Earth (Ground)
	Line
	Line Connection
	Auxiliary Power
115V 15A ~	Receptacle Rating- Auxiliary Power

1 ~	Single Phase
3 ~	Three Phase
	Three Phase Static Frequency Converter-Transformer-Rectifier
	Remote
X	Duty Cycle
%	Percentage
	Panel/Local
	Shielded Metal Arc Welding (SMAW)
	Gas Metal Arc Welding (GMAW)
	Gas Tungsten Arc Welding (GTAW)
	Air Carbon Arc Cutting (CAC-A)
	Constant Current
	Constant Voltage Or Constant Potential
	High Temperature
	Fault Indication
	Arc Force
	Touch Start (GTAW)
	Variable Inductance
	Voltage Input

	Wire Feed Function
	Wire Feed Towards Workpiece With Output Voltage Off.
	Welding Gun
	Purging Of Gas
	Continuous Weld Mode
	Spot Weld Mode
	Spot Time
	Preflow Time
	Postflow Time
	2 Step Trigger Operation Press to initiate wirefeed and welding, release to stop.
	4 Step Trigger Operation Press and hold for preflow, release to start arc. Press to stop arc, and hold for preflow.
	Burnback Time
IPM	Inches Per Minute
MPM	Meters Per Minute
	Art # A-04130

1.04 Precautions De Securite En Soudage A L'arc

MISE EN GARDE

LE SOUDAGE A L'ARC EST DANGEREUX

PROTEGEZ-VOUS, AINSI QUE LES AUTRES, CONTRE LES BLESSURES GRAVES POSSIBLES OU LA MORT. NE LAISSEZ PAS LES ENFANTS S'APPROCHER, NI LES PORTEURS DE STIMULATEUR CARDIAQUE (A MOINS QU'ILS N'AIENT CONSULTE UN MEDECIN). CONSERVEZ CES INSTRUCTIONS. LISEZ LE MANUEL D'OPERATION OU LES INSTRUCTIONS AVANT D'INSTALLER, UTILISER OU ENTRETENIR CET EQUIPEMENT.

Les produits et procédés de soudage peuvent sauser des blessures graves ou la mort, de même que des dommages au reste du matériel et à la propriété, si l'utilisateur n'adhère pas strictement à toutes les règles de sécurité et ne prend pas les précautions nécessaires.

En soudage et coupage, des pratiques sécuritaires se sont développées suite à l'expérience passée. Ces pratiques doivent être apprises par étude ou entraînement avant d'utiliser l'equipement. Toute personne n'ayant pas suivi un entraînement intensif en soudage et coupage ne devrait pas tenter de souder. Certaines pratiques concernent les équipements raccordés aux lignes d'alimentation alors que d'autres s'adressent aux groupes électrogènes.

La norme Z49.1 de l'American National Standard, intitulée "SAFETY IN WELDING AND CUTTING" présente les pratiques sécuritaires à suivre. Ce document ainsi que d'autres guides que vous devriez connaître avant d'utiliser cet équipement sont présentés à la fin de ces instructions de sécurité.

SEULES DES PERSONNES QUALIFIEES DOIVENT FAIRE DES TRAVAUX D'INSTALLATION, DE REPARATION, D'ENTRETIEN ET D'ESSAI.

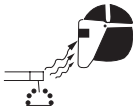
1.05 Dangers relatifs au soudage à l'arc

AVERTISSEMENT

L'ELECTROCUTION PEUT ETRE MORTELLE.

Une décharge électrique peut tuer ou brûler gravement. L'électrode et le circuit de soudage sont sous tension dès la mise en circuit. Le circuit d'alimentation et les circuits internes de l'équipement sont aussi sous tension dès la mise en marche. En soudage automatique ou semi-automatique avec fil, ce dernier, le rouleau ou la bobine de fil, le logement des galets d'entrainement et toutes les pièces métalliques en contact avec le fil de soudage sont sous tension. Un équipement inadéquatement installé ou inadéquatement mis à la terre est dangereux.

1. Ne touchez pas à des pièces sous tension.
2. Portez des gants et des vêtements isolants, secs et non troués.
3 Isolez-vous de la pièce à souder et de la mise à la terre au moyen de tapis isolants ou autres.
4. Déconnectez la prise d'alimentation de l'équipement ou arrêtez le moteur avant de l'installer ou d'en faire l'entretien. Bloquez le commutateur en circuit ouvert ou enlevez les fusibles de l'alimentation afin d'éviter une mise en marche accidentelle.
5. Veuillez à installer cet équipement et à le mettre à la terre selon le manuel d'utilisation et les codes nationaux, provinciaux et locaux applicables.
6. Arrêtez tout équipement après usage. Coupez l'alimentation de l'équipement s'il est hors d'usage ou inutilisé.
7. N'utilisez que des porte-électrodes bien isolés. Ne jamais plonger les porte-électrodes dans l'eau pour les refroidir. Ne jamais les laisser traîner par terre ou sur les pièces à souder. Ne touchez pas aux porte-électrodes raccordés à deux sources de courant en même temps. Ne jamais toucher quelqu'un d'autre avec l'électrode ou le porte-électrode.
8. N'utilisez pas de câbles électriques usés, endommagés, mal épissés ou de section trop petite.
9. N'enroulez pas de câbles électriques autour de votre corps.
10. N'utilisez qu'une bonne prise de masse pour la mise à la terre de la pièce à souder.
11. Ne touchez pas à l'électrode lorsqu'en contact avec le circuit de soudage (terre).
12. N'utilisez que des équipements en bon état. Réparez ou remplacez aussitôt les pièces endommagées.
13. Dans des espaces confinés ou mouillés, n'utilisez pas de source de courant alternatif, à moins qu'il soit muni d'un réducteur de tension. Utilisez plutôt une source de courant continu.
14. Portez un harnais de sécurité si vous travaillez en hauteur.
15. Fermez solidement tous les panneaux et les capots.



AVERTISSEMENT

LE RAYONNEMENT DE L'ARC PEUT BRÛLER LES YEUX ET LA PEAU; LE BRUIT PEUT ENDOMMAGER L'OUIE.

L'arc de soudage produit une chaleur et des rayons ultraviolets intenses, susceptibles de brûler les yeux et la peau. Le bruit causé par certains procédés peut endommager l'ouïe.

1. Portez une casque de soudeur avec filtre oculaire de nuance appropriée (consultez la norme ANSI Z49 indiquée ci-après) pour vous protéger le visage et les yeux lorsque vous soudez ou que vous observez l'exécution d'une soudure.
2. Portez des lunettes de sécurité approuvées. Des écrans latéraux sont recommandés.
3. Entourez l'aire de soudage de rideaux ou de cloisons pour protéger les autres des coups d'arc ou de l'éblouissement; avertissez les observateurs de ne pas regarder l'arc.
4. Portez des vêtements en matériaux ignifuges et durables (laine et cuir) et des chaussures de sécurité.
5. Portez un casque antibruit ou des bouchons d'oreille approuvés lorsque le niveau de bruit est élevé.

AVERTISSEMENT

LES VAPEURS ET LES FUMEES SONT DANGEREUSES POUR LA SANTE.

Le soudage dégage des vapeurs et des fumées dangereuses à respirer.

1. Eloignez la tête des fumées pour éviter de les respirer.
2. A l'intérieur, assurez-vous que l'aire de soudage est bien ventilée ou que les fumées et les vapeurs sont aspirées à l'arc.
3. Si la ventilation est inadequate, portez un respirateur à adduction d'air approuvé.
4. Lisez les fiches signalétiques et les consignes du fabricant relatives aux métaux, aux produits consummables, aux revêtements et aux produits nettoyants.
5. Ne travaillez dans un espace confiné que s'il est bien ventilé; sinon, portez un respirateur à adduction d'air. Les gaz protecteurs de soudage peuvent déplacer l'oxygène de l'air et ainsi causer des malaises ou la mort. Assurez-vous que l'air est propre à la respiration.
6. Ne soudez pas à proximité d'opérations de dégraissage, de nettoyage ou de pulvérisation. La chaleur et les rayons de l'arc peuvent réagir avec des vapeurs et former des gaz hautement toxiques et irritants.
7. Ne soudez des tôles galvanisées ou plaquées au plomb ou au cadmium que si les zones à souder ont été grattées à fond, que si l'espace est bien ventilé; si nécessaire portez un respirateur à adduction d'air. Car ces revêtements et tout métal qui contient ces éléments peuvent dégager des fumées toxiques au moment du soudage.

SELECTION DES NUANCES DE FILTRES OCULAIRS POUR LA PROTECTION DES YEUX EN COUPAGE ET SOUDAGE (selon AWS á 8.2-73)

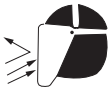
Opération de coupage ou soudage	Dimension d'électrode ou Epiasseur de métal ou Intensité de courant	Nuance de filtre oculaire	Opération de coupage ou soudage	Dimension d'électrode ou Epiasseur de métal ou Intensité de courant	Nuance de filtre oculaire
Brassage tendre au chalumeau	toutes conditions	2	Soudage á l'arc sous gaz avec fil plein (GMAW)		
Brassage fort au chalumeau	toutes conditions	3 ou 4	métaux non-ferreux	toutes conditions	11
Oxycoupage			métaux ferreux	toutes conditions	12
mince	moins de 1 po. (25 mm)	2 ou 3	Soudage á l'arc sous gaz avec électrode de tungstène (GTAW)	toutes conditions	12
moyen	de 1 á 6 po. (25 á 150 mm)	4 ou 5	Soudage á l'hydrogène atomique (AHW)	toutes conditions	12
épais	plus de 6 po. (150 mm)	5 ou 6	Soudage á l'arc avec électrode de carbone (CAW)	toutes conditions	12
Soudage aux gaz			Soudage á l'arc Plasma (PAW)	toutes dimensions	12
mince	moins de 1/8 po. (3 mm)	4 ou 5	Gougeage Air-Arc avec électrode de carbone		
moyen	de 1/8 á 1/2 po. (3 á 12 mm)	5 ou 6	mince		12
épais	plus de 1/2 po. (12 mm)	6 ou 8	épais		14
Soudage á l'arc avec électrode enrobees (SMAW)	moins de 5/32 po. (4 mm)	10	Coupage á l'arc Plasma (PAC)		
	5/32 á 1/4 po. (4 á 6.4 mm)	12	mince	moins de 300 amperès	9
	plus de 1/4 po. (6.4 mm)	14	moyen	de 300 á 400 amperès	12
			épais	plus de 400 amperès	14

AVERTISSEMENT

LE SOUDAGE PEUT CAUSER UN INCENDIE OU UNE EXPLOSION

L'arc produit des étincellies et des projections. Les particules volantes, le métal chaud, les projections de soudure et l'équipement surchauffé peuvent causer un incendie et des brûlures. Le contact accidentel de l'électrode ou du fil-électrode avec un objet métallique peut provoquer des étincelles, un échauffement ou un incendie.

1. Protégez-vous, ainsi que les autres, contre les étincelles et du métal chaud.
2. Ne soudez pas dans un endroit où des particules volantes ou des projections peuvent atteindre des matériaux inflammables.
3. Enlevez toutes matières inflammables dans un rayon de 10, 7 mètres autour de l'arc, ou couvrez-les soigneusement avec des bâches approuvées.
4. Méfiez-vous des projections brulantes de soudage susceptibles de pénétrer dans des aires adjacentes par de petites ouvertures ou fissures.
5. Méfiez-vous des incendies et gardez un extincteur à portée de la main.
6. N'oubliez pas qu'une soudure réalisée sur un plafond, un plancher, une cloison ou une paroi peut enflammer l'autre côté.
7. Ne soudez pas un récipient fermé, tel un réservoir ou un baril.
8. Connectez le câble de soudage le plus près possible de la zone de soudage pour empêcher le courant de suivre un long parcours inconnu, et prévenir ainsi les risques d'électrocution et d'incendie.
9. Ne dégelez pas les tuyaux avec un source de courant.
10. Otez l'électrode du porte-électrode ou coupez le fil au tube-contact lorsqu'inutilisé après le soudage.
11. Portez des vêtements protecteurs non huileux, tels des gants en cuir, une chemise épaisse, un pantalon revers, des bottines de sécurité et un casque.



AVERTISSEMENT

LES ETINCELLES ET LES PROJECTIONS BRULANTES PEUVENT CAUSER DES BLESSURES.

Le piquage et le meulage produisent des particules métalliques volantes. En refroidissant, la soudure peut projeter du éclats de laitier.

1. Portez un écran facial ou des lunettes protectrices approuvées. Des écrans latéraux sont recommandés.
2. Portez des vêtements appropriés pour protéger la peau.

AVERTISSEMENT

LES BOUTEILLES ENDOMMAGEES PEUVENT EXPLOSER

Les bouteilles contiennent des gaz protecteurs sous haute pression. Des bouteilles endommagées peuvent exploser. Comme les bouteilles font normalement partie du procédé de soudage, traitez-les avec soin.

1. Protégez les bouteilles de gaz comprimé contre les sources de chaleur intense, les chocs et les arcs de soudage.
2. Enchainez verticalement les bouteilles à un support ou à un cadre fixe pour les empêcher de tomber ou d'être renversées.
3. Eloignez les bouteilles de tout circuit électrique ou de tout soudage.
4. Empêchez tout contact entre une bouteille et une électrode de soudage.
5. N'utilisez que des bouteilles de gaz protecteur, des détendeurs, des boyauxs et des raccords conçus pour chaque application spécifique; ces équipements et les pièces connexes doivent être maintenus en bon état.
6. Ne placez pas le visage face à l'ouverture du robinet de la bouteille lors de son ouverture.
7. Laissez en place le chapeau de bouteille sauf si en utilisation ou lorsque raccordé pour utilisation.
8. Lisez et respectez les consignes relatives aux bouteilles de gaz comprimé et aux équipements connexes, ainsi que la publication P-1 de la CGA, identifiée dans la liste de documents ci-dessous.

AVERTISSEMENT

LES MOTEURS PEUVENT ETRE DANGEREUX

LES GAZ D'ECHAPPEMENT DES MOTEURS PEUVENT ETRE MORTELS.

Les moteurs produisent des gaz d'échappement nocifs.

1. Utilisez l'équipement à l'extérieur dans des aires ouvertes et bien ventilées.
2. Si vous utilisez ces équipements dans un endroit confiné, les fumées d'échappement doivent être envoyées à l'extérieur, loin des prises d'air du bâtiment.

AVERTISSEMENT

LE CARBURANT PEUR CAUSER UN INCENDIE OU UNE EXPLOSION.

Le carburant est hautement inflammable.

1. Arrêtez le moteur avant de vérifier le niveau e carburant ou de faire le plein.

2. Ne faites pas le plein en fumant ou proche d'une source d'étincelles ou d'une flamme nue.
3. Si c'est possible, laissez le moteur refroidir avant de faire le plein de carburant ou d'en vérifier le niveau au début du soudage.
4. Ne faites pas le plein de carburant à ras bord: prévoyez de l'espace pour son expansion.
5. Faites attention de ne pas renverser de carburant. Nettoyez tout carburant renversé avant de faire démarrer le moteur.

AVERTISSEMENT

DES PIECES EN MOUVEMENT PEUVENT CAUSER DES BLESSURES.

Des pièces en mouvement, tels des ventilateurs, des rotors et des courroies peuvent couper doigts et mains, ou accrocher des vêtements amples.

1. Assurez-vous que les portes, les panneaux, les capots et les protecteurs soient bien fermés.
2. Avant d'installer ou de connecter un système, arrêtez le moteur.
3. Seules des personnes qualifiées doivent démonter des protecteurs ou des capots pour faire l'entretien ou le dépannage nécessaire.
4. Pour empêcher un démarrage accidentel pendant l'entretien, débranchez le câble d'accumulateur à la borne négative.
5. N'approchez pas les mains ou les cheveux de pièces en mouvement; elles peuvent aussi accrocher des vêtements amples et des outils.
6. Réinstallez les capots ou les protecteurs et fermez les portes après des travaux d'entretien et avant de faire démarrer le moteur.

AVERTISSEMENT

DES ETINCELLES PEUVENT FAIRE EXPLOSER UN ACCUMULATEUR; L'ELECTROLYTE D'UN ACCUMU-LATEUR PEUT BRULER LA PEAU ET LES YEUX.

Les accumulateurs contiennent de l'électrolyte acide et dégagent des vapeurs explosives.

1. Portez toujours un écran facial en travaillant sur un accumu-lateur.
2. Arrêtez le moteur avant de connecter ou de déconnecter des câbles d'accumulateur.
3. N'utilisez que des outils anti-étincelles pour travailler sur un accumulateur.
4. N'utilisez pas une source de courant de soudage pour charger un accumulateur ou survolter momentanément un véhicule.
5. Utilisez la polarité correcte (+ et –) de l'accumulateur.

AVERTISSEMENT

LA VAPEUR ET LE LIQUIDE DE REFROIDISSEMENT BRULANT SOUS PRESSION PEUVENT BRULER LA PEAU ET LES YEUX.

Le liquide de refroidissement d'un radiateur peut être brûlant et sous pression.

1. N'ôtez pas le bouchon de radiateur tant que le moteur n'est pas refroidi.
2. Mettez des gants et posez un torchon sur le bouchon pour l'ôter.
3. Laissez la pression s'échapper avant d'ôter complètement le bouchon.

PLOMB AVERTISSEMENT

Ce produit contient des produits chimiques, comme le plomb, ou engendre des produits chimiques, reconnus par l'état de Californie comme pouvant être à l'origine de cancer, de malformations fœtales ou d'autres problèmes de reproduction. Il faut se laver les mains après toute manipulation. (Code de Californie de la sécurité et santé, paragraphe 25249.5 et suivants)

1.06 Principales Normes De Securite

Safety in Welding and Cutting, norme ANSI Z49.1, American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33128.

Safety and Health Standards, OSHA 29 CFR 1910, Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, norme AWS F4.1, American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33128.

National Electrical Code, norme 70 NFPA, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

Safe Handling of Compressed Gases in Cylinders, document P-1, Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

Code for Safety in Welding and Cutting, norme CSA W117.2 Association canadienne de normalisation, Standards Sales, 276 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.

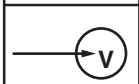
Safe Practices for Occupation and Educational Eye and Face Protection, norme ANSI Z87.1, American National Standards Institute, 1430 Broadway, New York, NY 10018.

Cutting and Welding Processes, norme 51B NFPA, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

1.07 Graphique de Symbole

Seulement certains de ces symboles apparaîtront sur votre modèle.

	Sous Tension
	Hors Tension
	Tension dangereuse
	Augmentez/Diminuer
	Disjoncteur
	Source AC Auxiliaire
	Fusible
	Intensité de Courant
	Tension
	Hertz (cycles/sec)
	Fréquence
	Négatif
	Positif
	Courant Continue (DC)
	Terre de Protection
	Ligne
	Connexion de la Ligne
	Source Auxiliaire
115V 15A 	Classement de Prise-Source Auxiliaire

1 	Mono Phasé
3 	Trois Phasé
	Tri-Phase Statique Fréquence Convertisseur Transformateur-Redresseur
	Distant
X	Facteur de Marche
%	Pourcentage
	Panneau/Local
	Soudage Arc Electrique Avec Electrode Enrobé (SMAW)
	Soudage á L'arc Avec Fil Electrodes Fusible (GMAW)
	Soudage á L'arc Avec Electrode Non Fusible (GTAW)
	Decoupe Arc Carbone (CAC-A)
	Courant Constant
	Tension Constante Ou Potentiel Constant
	Haute Température
	Force d'Arc
	Amorçage de L'arc au Contact (GTAW)
	Inductance Variable
	Tension

	Déroulement du Fil
	Alimentation du Fil Vers la Pièce de Fabrication Hors Tension
	Torch de Soudage
	Purge Du Gaz
	Mode Continu de Soudure
	Soudure Par Point
	Duréc du Pulse
	Durée de Pré-Dèbit
	Durée de Post-Dèbit
Détente à 2-Temps Appuyez pour dèruarer l'alimentation du fils et la soudure, le relâcher pour arrêter.	
Détente à 4-Temps Maintenez appuyez pour pré-dèbit, relailez pour initier l'arc. Appuyez pour arrêter l'arc, et mainteuir pour pré-dèbit.	
	Probléme de Terre
IPM	Pouces Par Minute
MPM	Mètres Par Minute
	Art # A-07639

1.08 Declaration Of Conformity

Manufacturer: Thermadyne Corporation
Address: 82 Benning Street
West Lebanon, New Hampshire 03784
USA

The equipment described in this manual has been designed to all applicable aspects and regulations of the 'Low Voltage Directive' (2006/95 EC) and to the National legislation for the enforcement of this Directive.

Serial numbers are unique with each individual piece of equipment and details description, parts used to manufacture a unit and date of manufacture.

National Standard and Technical Specifications

The product is designed and manufactured to a number of standards and technical requirements. Among them are:

- CSA E60974-1 applicable to welding equipment and associated accessories.

- Extensive product design verification is conducted at the manufacturing facility as part of the routine design and manufacturing process. This is to ensure the product is safe, when used according to instructions in this manual and related industry standards, and performs as specified. Rigorous testing is incorporated into the manufacturing process to ensure the manufactured product meets or exceeds all design specifications.

Thermadyne has been manufacturing products for more than 30 years, and will continue to achieve excellence in our area of manufacture.

Manufacturers responsible representative:

Elaine Slatter
Country Manager/Director
Thermadyne Canada
2070 Wyecroft Raod
Oakville, Ontario L6L5V6 Canada

SECTION 2: INTRODUCTION

2.01 How to Use This Manual

This Operating Manual usually applies to the part numbers listed on page i. If none are underlined, they are all covered by this manual. To ensure safe operation, read the entire manual, including the chapter on safety instructions and warnings. Throughout this manual, the word WARNING, CAUTION and NOTE may appear. Pay particular attention to the information provided under these headings. These special annotations are easily recognized as follows:

WARNING

Gives information regarding possible personal injury. Warnings will be enclosed in a box such as this.

CAUTION

Refers to possible equipment damage. Cautions will be shown in bold type.

NOTE

Offers helpful information concerning certain operating procedures. Notes will be shown in italics

2.02 Equipment Identification

The unit's identification number (specification or part number), model, and serial number usually appear on a nameplate attached to the machine. Equipment which does not have a nameplate attached to the machine is identified only by the specification or part number printed on the shipping container. Record these numbers for future reference.

2.03 Receipt of Equipment

When you receive the equipment, check it against the invoice to make sure it is complete and inspect the equipment for possible damage due to shipping. If there is any damage, notify the carrier immediately to file a claim. Furnish complete information concerning damage claims or shipping errors to the location in your area listed in the inside back cover of this manual. Include all equipment identification numbers as described above along with a full description of the parts in error.

2.04 Description

This compact inverter welding machine has infinitely adjustable welding current from 5 to 95 amps. It uses standard general purpose SMAW 3/32" (2.5mm) electrodes for light gauge work, generally less than 1/8" (3.2mm) thick. The unit also has a GTAW (Lift TIG) welding mode that offers stable TIG welding characteristics when used with a suitable TIG torch and shielding gas.

2.05 Transportation Methods

CAUTION

ELECTRIC SHOCK can kill. DO NOT TOUCH live electric parts. Disconnect input power conductors from de-energized supply line before moving the welding power source.

WARNING

FALLING EQUIPMENT can cause serious personal injury and equipment damage.

Lift unit with handle on top of case. Use handcart or similar device of adequate capacity. If using a fork lift vehicle, place secure unit on a proper skid before transporting.

2.06 Duty Cycle

The rated duty cycle of a Welding Power Source, is a statement of the time it may be operated at its rated welding current output without exceeding the temperature limits of the insulation of the component parts. To explain the 10 minute duty cycle period the following example is used. Suppose a Welding Power Source is designed to operate at a 40% duty cycle, 75 amperes at 23 volts. This means that it has been designed and built to provide the rated amperage (75A) for 4 minutes, i.e. arc welding time, out of every 10 minute period (40% of 10 minutes is 4 minutes). During the other 6 minutes of the 10 minute period the Welding Power Source must idle and allowed to cool.

2.07 Specifications

Power Source Part Number	*W1003206*
Welding Output	
Welding Current Range	*5 - 95 Amps*
Nominal DC Open Circuit Voltage (OCV)	*60V*
Welding Output, 104º F (40º C), 10 min. (quoted figures refer to SMAW output)	*40A / 21.8V @ 100%* *55A / 22.2V @ 60%* *75A / 23V @ 30%*
Rated Input Current (A) for SMAW (Stick) Welding	*28A* *Io=75A@23V*
Rated Input Current (A) for GTAW (LiftTIG) Welding	*21.0A* *Io = 95A@13.8V*
Rated Output for SMAW (Stick) Welding	*75A / 23V @ 30%*
Rated Output for GTAW (LiftTIG) Welding	*95A / 13.8V @ 20%*
Duty Cycle (%)	*20% @ 95A / 13.8V*
Welder Type	*Inverter Power Source*
Output Terminal Type	*Dinse 25*
Mains Power	
Number of Phases	*Single Phase*
Nominal Supply Voltage	*115V*
Nominal Supply Frequency	*60 Hz*
Effective Input Current (I1eff)	*15.0 Amps*
Maximum Input Current (I1 max)	*Δ 27 Amps*
Single Phase Generator Requirements	*6 KVA*
Classification	
Protection Class	*IP23S*
Standards	*IEC 60974-1*
Cooling Method	*Fan Cooled*
Dimensions and Weight	
Welding Power Source Mass	*9.7 lb. (4.4 kg)*
Welding Power Source Dimensions (Height x Width x Depth)	*H 13.0" x W 5.1" x D 9.0"* *(H 330mm x W 130mm x D 230mm)*

Δ The recommended time delay fuse or circuit breaker size is 20 amp. An individual branch circuit capable of carrying 20 amperes and protected by fuses or circuit breaker is recommended for this application. Fuse size is based on not more than 200 percent of the rated input amperage of the welding power source (Based on Article 630, National Electrical Code).

Thermal Arc continuously strives to produce the best product possible and therefore reserves the right to change, improve or revise the specifications or design of this or any product without prior notice. Such updates or changes do not entitle the buyer of equipment previously sold or shipped to the corresponding changes, updates, improvements or replacement of such items.

The values specified in the table above are optimal values, your values may differ. Individual equipment may differ from the above specifications due to in part, but not exclusively, to any one or more of the following; variations or changes in manufactured components, installation location and conditions and local power grid supply conditions.

SECTION 3: INSTALLATION

3.01 Environment

These units are designed for use in environments with increased hazard of electric shock. Examples of environments with increased hazard of electric shock are:

A. In locations in which freedom of movement is restricted, so that the operator is forced to perform the work in a cramped (kneeling, sitting or lying) position with physical contact with conductive parts.

B. In locations which are fully or partially limited by conductive elements, and in which there is a high risk of unavoidable or accidental contact by the operator.

C. In wet or damp hot locations where humidity or perspiration considerably reduces the skin resistance of the human body and the insulation properties of accessories.

Environments with increased hazard of electric shock do not include places where electrically conductive parts in the near vicinity of the operator, which can cause increased hazard, have been insulated.

3.02 Location

Be sure to locate the welder according to the following guidelines:

- In areas, free from moisture and dust.
- Ambient temperature between 32°F (0°C) to 104° F (40° C).
- In areas, free from oil, steam and corrosive gases.
- In areas, not subjected to abnormal vibration or shock.
- In areas, not exposed to direct sunlight or rain.
- Place at a distance of 12" (300mm) or more from walls or similar that could restrict natural air flow for cooling

WARNING

Thermal Arc advises that this equipment be electrically connected by a qualified electrician.

3.03 Electrical Input Connections

WARNING

ELECTRIC SHOCK can kill; SIGNIFICANT DC VOLTAGE is present after removal of input power.

DO NOT TOUCH live electrical parts.

SHUT DOWN welding power source, disconnect input power employing lockout/tagging procedures. Lock-out/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

• Electrical Input Requirements

Operate the welding power source from a single-phase 60 Hz, AC power supply. The input voltage must match one of the electrical input voltages shown on the input data label on the unit nameplate. Contact the local electric utility for information about the type of electrical service available, how proper connections should be made, and inspection required. The line disconnect switch provides a safe and convenient means to completely remove all electrical power from the welding power supply whenever necessary to inspect or service the unit.

Do not connect an input (WHITE or BLACK) conductor to the ground terminal.

Refer to Figure 3-1:

1. Connect end of ground (GREEN or GREEN/YELLOW) conductor to a suitable ground. Use a grounding method that complies with all applicable electrical codes.
2. Connect ends of line 1 (BLACK) and line 2 (WHITE) input conductors to a de-energized line disconnect switch.
3. Use Table 3-1 as a guide to select line fuses for the disconnect switch.

Input Voltage	Fuse Size
115V	20 Amps

CAUTION

The time-delay fuses or circuit breaker of an individual branch circuit may have nuisance tripping when welding with this product due to the amperage rating of the time-delay fuses or circuit breaker.

The recommended time-delay fuses or circuit breaker size is 20 amperes. Fuse/circuit breaker size is based on not more than 200 percent of the rated input amperage of the welding power source (Based on Article 630, National Electrical Code).

An individual branch circuit capable of carrying 20 amperes and time-delay fuses or circuit breaker protection is recommended for this application.

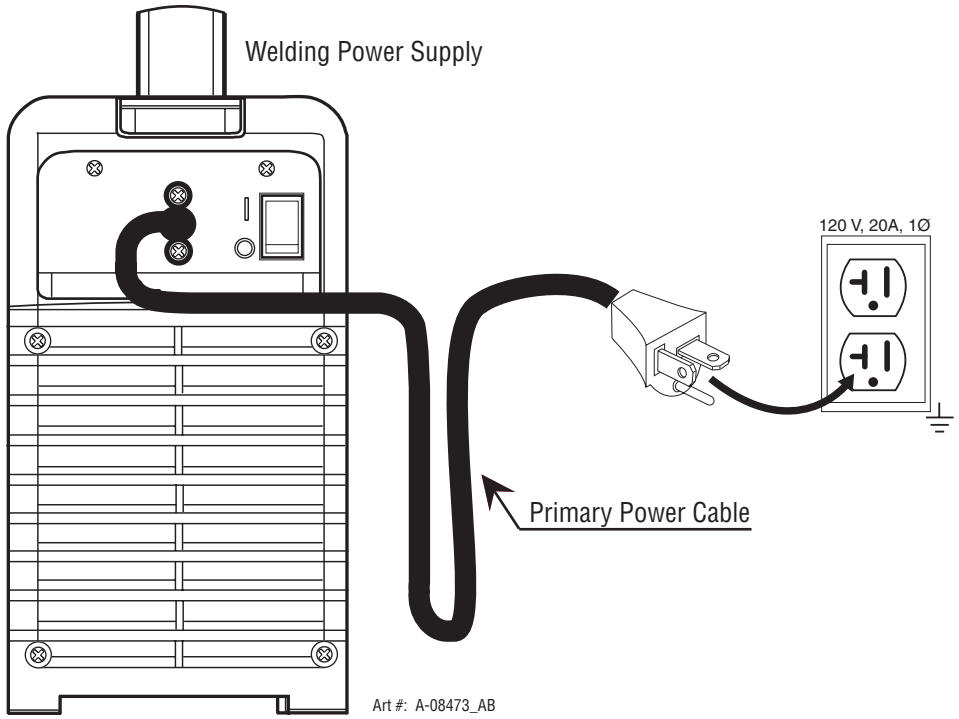


Figure 3-1: Electrical Input Connections

Input Power

Each unit incorporates an INRUSH circuit. When the MAIN CIRCUIT SWITCH is turned on, the inrush circuit provides pre-charging for the input capacitors. A relay in the Power Control Assembly (PCA) will turn on after the input capacitors have charged to operating voltage (after approximately 5 seconds)

NOTE

Damage to the PCA could occur if 133 VAC or higher is applied to the Primary Power Cable.

Model	Primary Supply Lead Size (Factory Fitted)	Minimum Primary Current Circuit Size (Vin/Amps)	Current & Duty Cycle	
			GTAW (Lift TIG)	SMAW (Stick)
Thermal Arc 95 S	12 AWG (3.3mm²)	115V/20A	-	75A / 23V @ 40%
		115V/21A	95A / 13.8V @ 20%	-

Table 3-2: Primary Circuit Sizes to Achieve Maximum Current

3.04 Electromagnetic Compatibility

WARNING

Extra precautions for Electromagnetic Compatibility may be required when this Welding Power Source is used in a domestic situation.

A. Installation and Use - Users Responsibility

The user is responsible for installing and using the welding equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the user of the welding equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing the welding circuit, see NOTE below. In other cases it could involve constructing an electromagnetic screen enclosing the Welding Power Source and the work, complete with associated input filters. In all cases, electromagnetic disturbances shall be reduced to the point where they are no longer Troublesome.

B. Assessment of Area

Before installing welding equipment, the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account.

1. Other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the welding equipment.
2. Radio and television transmitters and receivers.
3. Computer and other control equipment.
4. Safety critical equipment, e.g. guarding of industrial equipment.
5. The health of people around, e.g. the use of pacemakers and hearing aids.
6. Equipment used for calibration and measurement.
7. The time of day that welding or other activities are to be carried out.
8. The immunity of other equipment in the environment: the user shall ensure that other equipment being used in the environment is compatible: this may require additional protection measures.

The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

C. Methods of Reducing Electromagnetic Emissions

1. Mains Supply

   Welding equipment should be connected to the mains supply according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the mains supply. Consideration should be given to shielding the supply cable of permanently installed welding equipment in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the Welding Power Source so that good electrical contact is maintained between the conduit and the Welding Power Source enclosure.

2. Maintenance of Welding Equipment

   The welding equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the welding equipment is in operation. The welding equipment should not be modified in any way except for those changes and adjustments covered in the manufacturer's instructions. In particular, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturer's recommendation

3. Welding Cables

   The welding cables should be kept as short as possible and should be positioned close together, running at or close to the floor level.

4. Equipotential Bonding

   Bonding of all metallic components in the welding installation and adjacent to it should be considered. However, metallic components bonded to the work piece will increase the risk that the operator could receive a shock by touching the metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

5. Earthing of the Work Piece

   Where the work piece is not bonded to earth for electrical safety, nor connected to earth because of its size and position, e.g. ship's hull or building steelwork, a connection bonding the work piece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the work piece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the work piece to earth should be made by direct connection to the work piece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

6. Screening and Shielding

   Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening the entire welding installation may be considered for special applications.

3.05 Setup for Welding

NOTE

Conventional operating procedures apply when using the Welding Power Source, i.e. connect work lead directly to work piece and electrode lead is used to hold electrode. Wide safety margins provided by the design ensure that the Welding Power Source will withstand short-term overload without adverse effects. The welding current range values should be used as a guide only. Current delivered to the arc is dependent on the welding arc voltage, and as welding arc voltage varies between different classes of electrodes, welding current at any one setting would vary according to the type of electrode in use. The operator should use the welding current range values as a guide then fine tune the welding current to suit the application.

WARNING

Before connecting the work clamp to the work and inserting the electrode in the electrode holder make sure the Primary power supply is switched off.

3.06 SMAW (Stick) Setup

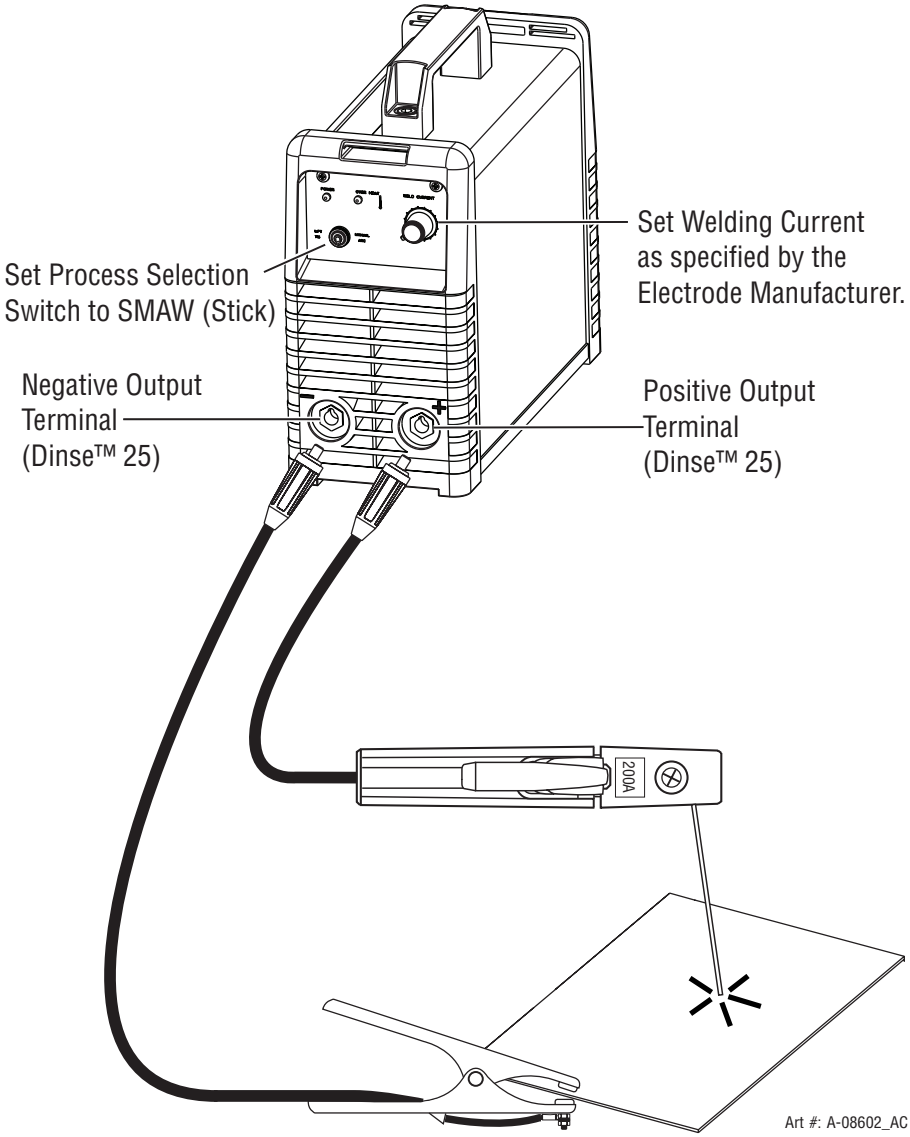


Figure 3-2: Setup for SMAW (Stick) Welding

SMAW (Stick) Mode Sequence of Operation

CAUTION

Before any welding is to begin, be sure to wear all appropriate and recommended safety equipment.

1. Switch the ON/OFF Switch (located on the rear panel) to OFF.
2. Connect the ground clamp cable to the negative output terminal, and the electrode holder cable to the positive output terminal.

NOTE

This set up is known as DC Electrode Positive or reverse polarity. Please consult with the stick electrode manufacturer for specific polarity recommendations.

3. Connect the ground clamp to your workpiece.
4. Plug the power cable into the appropriate outlet, and turn the switch to the "ON" position. The power L.E.D light should illuminate.
5. Set the "Process Selection Switch" to SMAW (Stick)
6. Set the weld current control knob to the desired amperage.
7. Install a stick electrode in the electrode holder.
8. You are now ready to begin SMAW (Stick) Welding

NOTE

Gently strike the electrode on the work piece to generate a welding arc, and slowly move along the work piece while holding a consistent arc length above base metal.

3.07 GTAW (Lift TIG) Setup

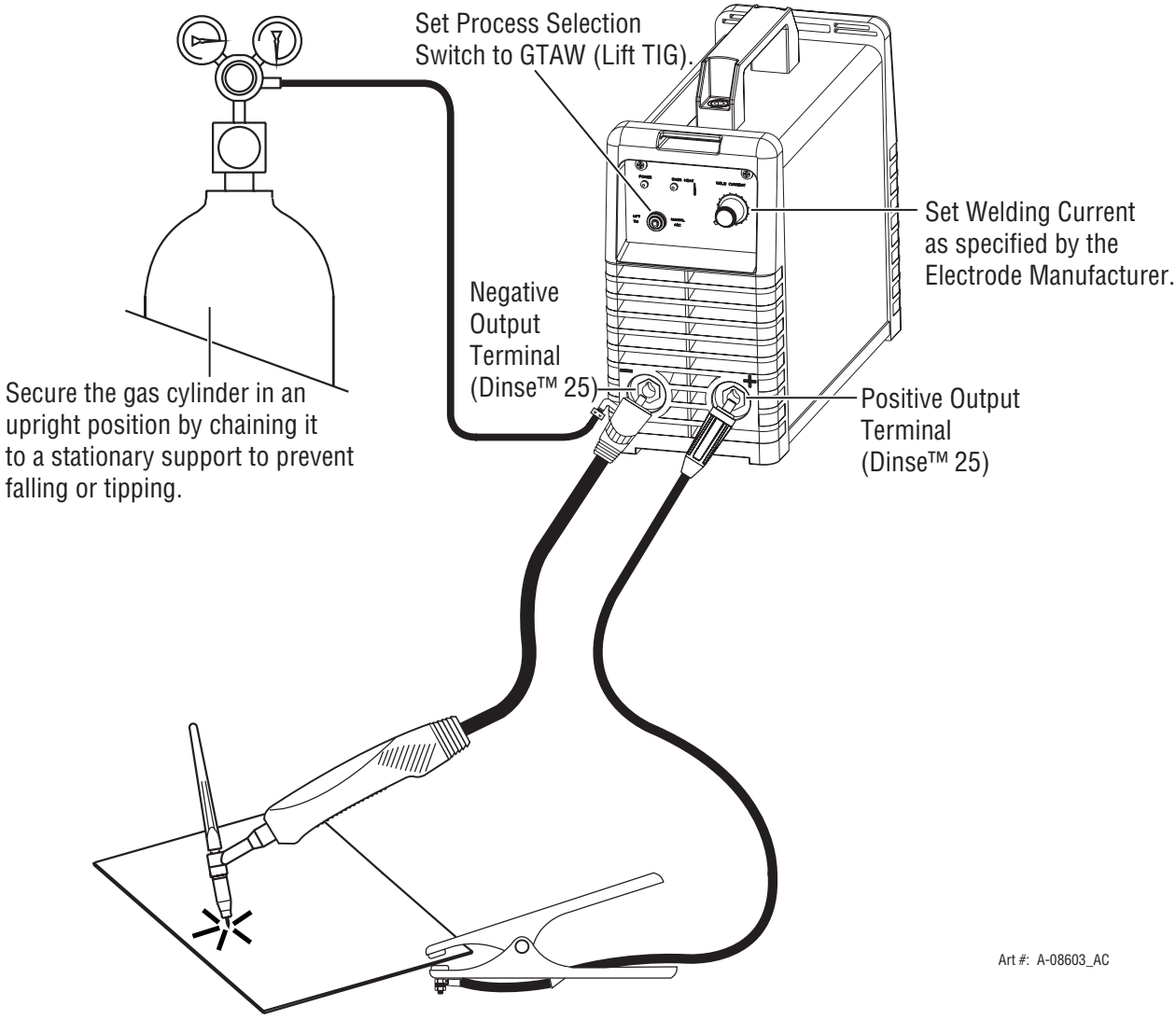


Figure 3-3: Setup for GTAW (Lift TIG) Welding

GTAW (Lift TIG) Sequence of Operation

CAUTION

Before any welding is to begin, be sure to wear all appropriate and recommended safety equipment.

1. Switch the ON/OFF Switch (located on the rear panel) to OFF.
2. Connect the ground clamp cable to positive output terminal, and the TIG torch cable to the negative output terminal.

NOTE

This set up is known as Straight Polarity or DC Electrode Negative. This is commonly used for DC TIG welding on most materials such as steel and stainless steel.

3. Using a secured Argon cylinder, slowly crack open then close the cylinder valve while standing off to the side of the valve. This will remove any debris that may be around the valve & regulator seat area.
4. Install the regulator and tighten with a wrench.
5. Connect the gas hose to the outlet of the Argon regulator, and tighten with a wrench.
6. Be sure the gas valve on the torch is closed, and slowly open the Argon Cylinder Valve to the fully open position.
7. Connect the ground clamp to your work piece.
8. Plug the power cable into the appropriate outlet, and turn the switch to the “ON” position. The power L.E.D. light should illuminate.

9. Set the “Process Selection Switch” to GTAW (Lift TIG)
10. Set the weld current control knob to the desired amperage.
11. The tungsten must be ground to a blunt point in order to achieve optimum welding results. It is critical to grind the tungsten electrode in the direction the grinding wheel is turning.
12. Install the tungsten with approximately 1/8” to ¼” sticking out from the gas cup, ensuring you have correct sized collet.
13. Tighten the back cap.
14. You are now ready to begin TIG Welding

NOTE

Open the gas valve on TIG torch handle, and adjust the pressure of regulator to 15-25 cubic feet per hour. This gas flow should be sufficient for most TIG welding applications.

ii. Touch the tungsten to the work piece. This closes the welding circuit, and the arc starts by slowly LIFTING the torch off the base metal. Keep a consistent arc length of about 1/8-1/4”.

iii. If necessary re-adjust the amperage setting to an appropriate level.

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SECTION 4: OPERATION

Conventional operating procedures apply when using the Welding Power Source, i.e. connect work lead directly to work piece and electrode lead is used to hold the electrode. The welding current range values should be used as a guide only. Current delivered to the arc is dependent on the welding arc voltage, and as welding arc voltage varies between different classes of electrode, welding current at any one setting would vary according to the type of electrode in use. The operator should use the welding current range values as a guide then fine tune the welding current to suit the specific application. Refer to the electrode manufacture's literature for further information.

4.01 Front Panel

(A) Process Selection Switch

Switches between GTAW (Lift TIG) and SMAW (Stick) Welding modes.

(B) Power On Indicator

The Power ON Indicator illuminates when the ON/OFF switch is in the ON position and the nominal mains voltage is present.

(C) Over Heat Indicator

The welding power source is protected by a self resetting thermostat. The indicator will illuminate if the duty cycle of the power source has been exceeded. If the Over Heat light illuminates wait for the Over Heat light to extinguish before resuming welding.

(D) Welding Current Control

The welding current is increased by turning the Weld Current control knob clockwise or decreased by turning the Weld Current control knob counterclockwise. The welding current should be set according to the specific application. Refer to the electrode manufacture's literature for further information.

(E) ON/OFF Switch (located on rear panel - not shown)

This switch controls the Mains Supply Voltage to the Power Source.

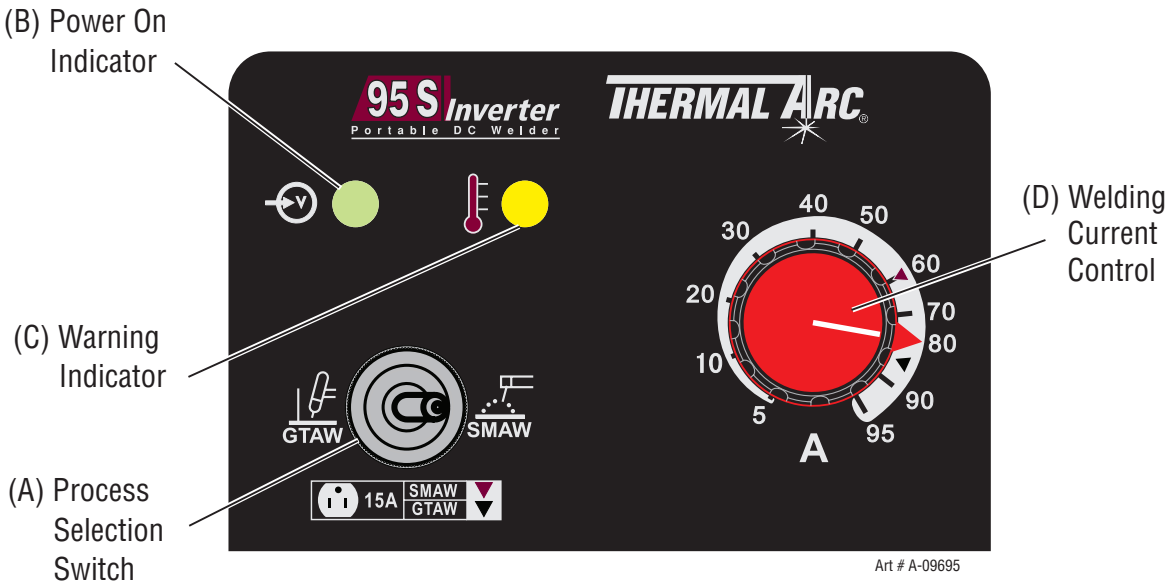


Figure 4-1: 95 S Controls

4.02 SMAW Electrode Polarity

Stick electrodes are generally connected to the "+" Positive Output Terminal and the work lead to the "–" Negative Output Terminal but if in doubt consult the electrode manufacturers literature for further information.

4.03 Effects of SMAW (Stick) Welding Various Materials

High Tensile and Alloy Steels

The two most prominent effects of welding these steels are the formation of a hardened zone in the weld area, and, if suitable precautions are not taken, the occurrence in this zone of under-bead cracks. Hardened zone and under-bead cracks in the weld area may be reduced by using the correct electrodes, preheating, using higher current settings, using larger electrodes sizes, short runs for larger electrode deposits or tempering in a furnace.

Manganese Steels

The effect on manganese steel of slow cooling from high temperatures is to embrittle it. For this reason it is absolutely essential to keep manganese steel cool during welding by quenching after each weld or skip welding to distribute the heat.

Cast Iron

Most types of cast iron, except white iron, are weldable. White iron, because of its extreme brittleness, generally cracks when attempts are made to weld it. Trouble may also be experienced when welding white-heart malleable, due to the porosity caused by gas held in this type of iron.

Copper and Alloys

The most important factor is the high rate of heat conductivity of copper, making pre-heating of heavy sections necessary to give proper fusion of weld and base metal.

Types of Electrodes

Arc Welding electrodes are classified into a number of groups depending on their applications. There are a great number of electrodes used for specialized industrial purposes which are not of particular interest for everyday general work. These include some low hydrogen types for high tensile steel, cellulose types for welding large diameter pipes, etc The range of electrodes dealt with in this publication will cover the vast majority of applications likely to be encountered; are all easy to use.

Metal Being Joined	Electrode	Comments
Mild Steel	6013	Ideal electrodes for all general purpose work, features include outstanding operator appeal, easy arc starting, and low spatter.
Mild Steel	7014	All positional eletrode for use on mild and galvanized steel furniture, plates, fences, gates, piples and tanks, etc. Especially suitable for vertical-down welding.
Cast Iron	99% Nickel	Suitable for joining all cast irons except white cast iron.
Stainless Steel	318L-16	High corrosion resistances. Ideal for dairy work etc.
Copper, Bronze, Etc.	Bronze 5.7 ERCUSI-A	Easy to use electrode for marine fittings, water taps and valves, water through floats arms, etc. Also for joining copper to steel and for bronze overlays on steel shafts.
Copper, Bronze, Dissimilar Metals, Crack Resistance, All Hard-to Weld Jobs	312-16	It will weld most problematic jobs such as springs, shafts, broken joins, mild steel to stainless and alloy steels. Not suitable for aluminum.

4.04 GTAW (Lift TIG) Electrode Polarity

Connect the TIG torch to the "-" Negative Output Terminal and the work lead to the "+" Positive Output Terminal for direct current straight polarity. Direct current straight polarity is the most widely used polarity for DC TIG welding. It allows limited wear of the electrode since 70% of the heat is concentrated at the work piece.

4.05 Guide for Selecting Filler Wire

Filler Wire Diameter	DC Current (Amps)
1/16" (1.6mm)	20 - 90
3/32" (2.4mm)	60 - 115

4.06 Tungsten Electrode Current Ranges

Electrode Diameter	DC Current
.040" (1.0mm)	20 - 90
1/16" (1.6mm)	60 - 115

4.07 Shielding Gas Selection

Alloy	Shielding Gas
Carbon Steel	Welding Argon
Stainless Steel	Welding Argon
Nickel Alloy	Welding Argon
Copper	Welding Argon
Titanium	Welding Argon

4.08 Tungsten Electrode Types

Electrode Type (Ground Finish)	Welding Application	Features	Color Code
Thoriated 2%	DC welding of mild steel, stainless steel and copper.	Excellent arc starting, long life, high current carrying capacity.	Red
Ceriated 2%	AC & DC welding of mild steel, stainless steel, copper, aluminum, magnesium and their alloys.	Longer life, more stable arc, easier starting, wider current range, narrower & more concentrated arc.	Grey

4.09 GTAW (Lift TIG) Welding Parameters for Steel

Base Metal Thickness	DC Current		Electrode Diameter	Filler Rod Diameter	Argon Gas Flow Rate	Joint / Type
	Mild Steel	Stainless Steel				
0.040" (1.0mm)	35-45	20-30	0.040" (1.0mm)	1/16" (1.6mm)	10 CFH (5 LPM)	Butt/Corner
	40-50	25-35				Lap/Filler
0.045" (1.22mm)	45-55	30-45	0.040" (1.0mm)	1/16" (1.6mm)	13 CFH (6 LPM)	Butt/Corner
	50-60	35-50				Lap/Filler
1/16" (1.6mm)	60-70	40-60	1/16" (1.6mm)	1/16" (1.6mm)	15 CFH (7 LPM)	Butt/Corner
	70-90	50-70				Lap/Filler
1/8" (3.2mm)	80-100	65-85	1/16" (1.16mm)	3/32" (2.4mm)	15CFH (7 LPM)	Butt/Corner
	90-115	90-110				Lap/Filler

4.10 Arc Welding Practice

The techniques used for arc welding are almost identical regardless of what types of metals are being joined. Naturally enough, different types of electrodes would be used for different metals as described in the preceding section.

4.11 Welding Position

The electrodes dealt with in this publication can be used in most positions, i.e. they are suitable for welding in flat, horizontal, vertical and overhead positions. Numerous applications call for welds to be made in positions intermediate between these. Some of the common types of welds are shown in Figures 4-2 through 4-9.

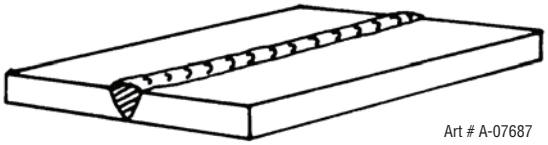


Figure 4-2: Flat position, down hand butt weld

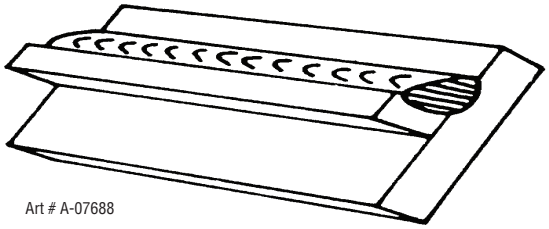


Figure 4-3: Flat position, gravity fillet weld

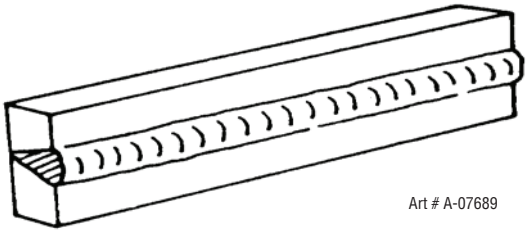


Figure 4-4: Horizontal position, butt weld

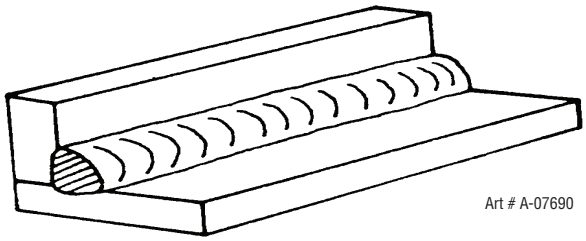


Figure 4-5: Horizontal - Vertical (HV) position

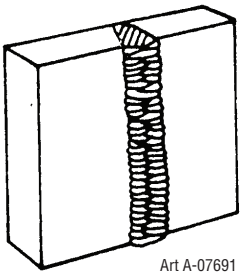


Figure 4-6: Vertical position, butt weld

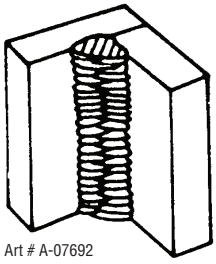


Figure 4-7: Vertical position, fillet weld

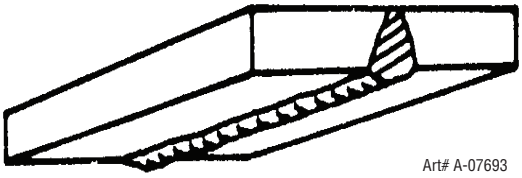


Figure 4-8: Overhead position, butt weld

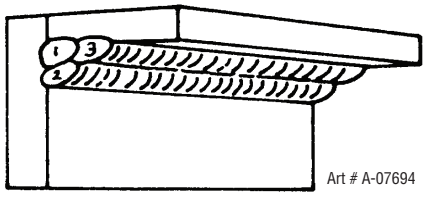


Figure 4-9: Overhead position, fillet weld

4.12 Joint Preparations

In many cases, it will be possible to weld steel sections without any special preparation. For heavier sections and for repair work on castings, etc., it will be necessary to cut or grind an angle between the pieces being joined to ensure proper penetration of the weld metal and to produce sound joints.

In general, surfaces being welded should be clean and free of rust, scale, dirt, grease, etc. Slag should be removed from oxy-cut surfaces. Typical joint designs are shown in Figure 4-10.

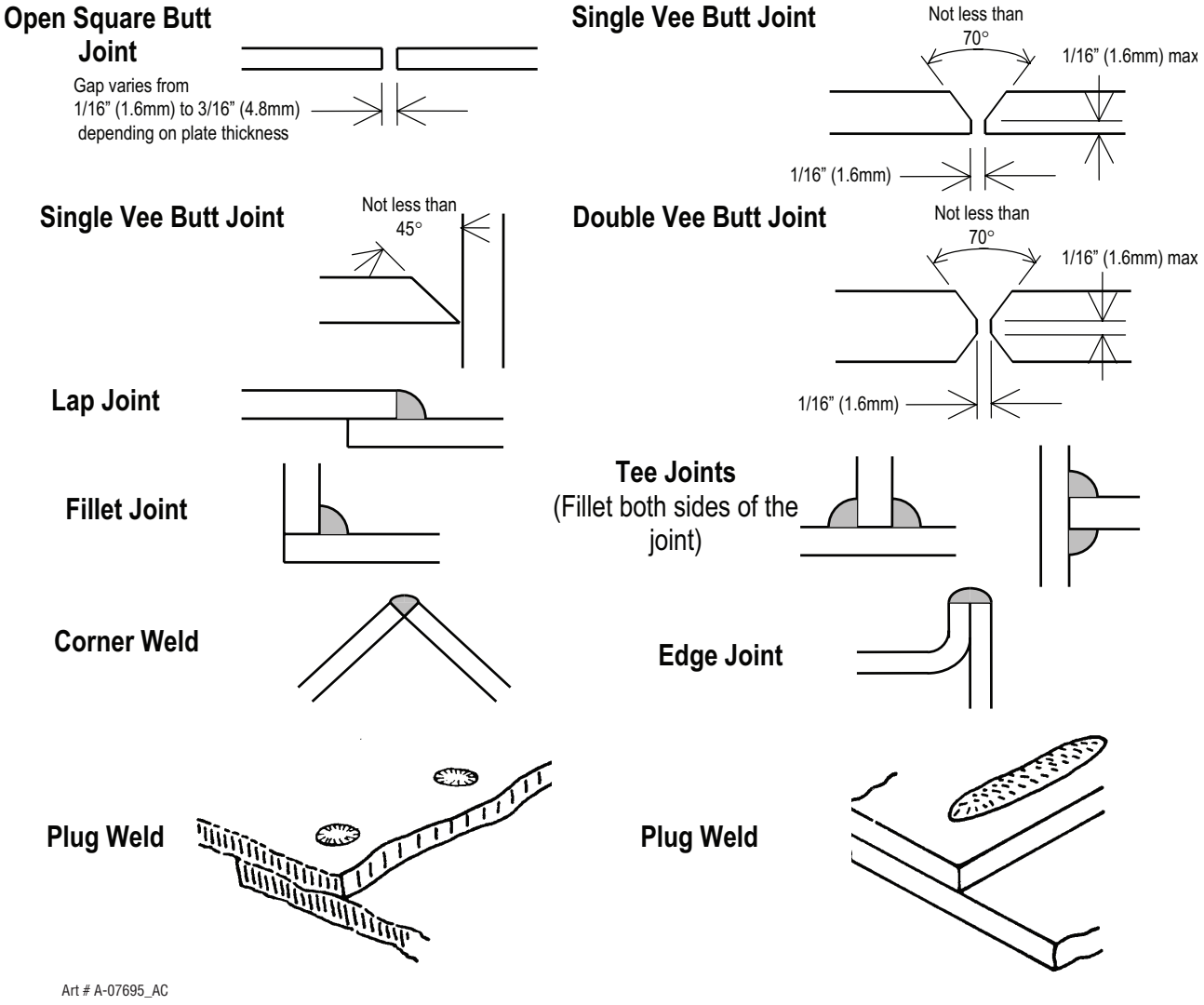


Figure 4-10: Typical joint designs for arc welding

4.13 Arc Welding Technique

A Word to Beginners

For those who have not yet done any welding, the simplest way to commence is to run beads on a piece of scrap plate. Use mild steel plate about 6.0mm thick and a 3.2mm electrode. Clean any paint, loose scale or grease off the plate and set it firmly on the work bench so that welding can be carried out in the downhand position. Make sure that the work clamp is making good electrical contact with the work, either directly or through the work table. For light gauge material, always clamp the work lead directly to the job, otherwise a poor circuit will probably result.

4.14 The Welder

Place yourself in a comfortable position before beginning to weld. Get a seat of suitable height and do as much work as possible sitting down. Don't hold your body tense. A taut attitude of mind and a tensed body will soon make you feel tired. Relax and you will find that the job becomes much easier. You can add much to your peace of mind by wearing a leather apron and gauntlets. You won't be worrying then about being burnt or sparks setting alight to your clothes.

Place the work so that the direction of welding is across, rather than to or from, your body. The electrode holder lead should be clear of any obstruction so that you can move your arm freely along as the electrode burns down. If the lead is slung over your shoulder, it allows greater freedom of movement and takes a lot of weight off your hand. Be sure the insulation on your cable and electrode holder is not faulty, otherwise you are risking an electric shock.

4.15 Striking the Arc

Practice this on a piece of scrap plate before going on to more exacting work. You may at first experience difficulty due to the tip of the electrode "sticking" to the work piece. This is caused by making too heavy a contact with the work and failing to withdraw the electrode quickly enough. A low amperage will accentuate it. This freezing-on of the tip may be overcome by scratching the electrode along the plate surface in the same way as a match is struck. As soon as the arc is established, maintain a 1/16" (1.6mm) to 1/8" (3.2mm) gap between the burning electrode end and the parent metal. Draw the electrode slowly along as it melts down.

Another difficulty you may meet is the tendency, after the arc is struck, to withdraw the electrode so far that the arc is broken again. A little practice will soon remedy both of these faults.

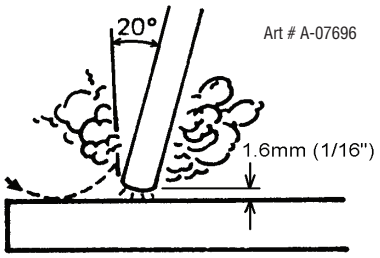


Figure 4-11: Striking an arc

4.16 Arc Length

The securing of an arc length necessary to produce a neat weld soon becomes almost automatic. You will find that arc produces a crackling or spluttering noise and the weld metal comes across in large, irregular blobs. The weld bead is flattened and spatter increases. A short arc is essential if a high quality weld is to be obtained although if it is too short there is the danger of it being blanketed by slag and the electrode tip being solidified in. If this should happen, give the electrode a quick twist back over the weld to detach it. Contact or "touch-weld" electrodes such as E7014 electrode do not stick in this way, and make welding much easier.

4.17 Rate of Travel

After the arc is struck, your next concern is to maintain it, and this requires moving the electrode tip towards the molten pool at the same rate as it is melting away. At the same time, the electrode has to move along the plate to form a bead. The electrode is directed at the weld pool at about 20° from the vertical. The rate of travel has to be adjusted so that a well-formed bead is produced.

If the travel is too fast, the bead will be narrow and strung out and may even be broken up into individual globules. If the travel is too slow, the weld metal piles up and the bead will be too large.

4.18 Making Welded Joints

Having attained some skill in the handling of an electrode, you will be ready to go on to make up welded joints.

A. Butt Welds

Set up two plates with their edges parallel, as shown in Figure 4-12, allowing 1/15" (1.6mm) to 3/32" (2.4mm) gap between them and tack weld at both ends. This is to prevent contraction stresses from the cooling weld metal pulling the plates out of alignment. Plates thicker than 1/4" (6.0mm) should have their mating edges beveled to form

a 70° to 90° included angle. This allows full penetration of the weld metal to the root. Using a 1/8" (3.2mm) E7014 electrode at 120 amps, deposit a run of weld metal on the bottom of the joint.

Do not weave the electrode, but maintain a steady rate of travel along the joint sufficient to produce a well-formed bead. At first you may notice a tendency for undercut to form, but keeping the arc length short, the angle of the electrode at about 20° from vertical, and the rate of travel not too fast, will help eliminate this. The electrode needs to be moved along fast enough to prevent the slag pool from getting ahead of the arc. To complete the joint in thin plate, turn the job over, clean the slag out of the back and deposit a similar weld.

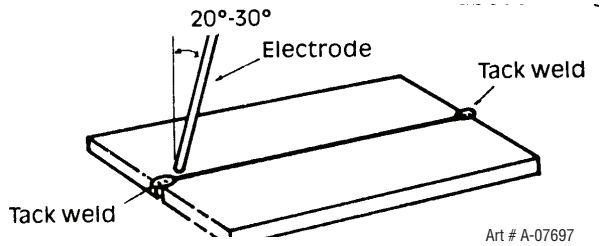


Figure 4-12: Butt weld

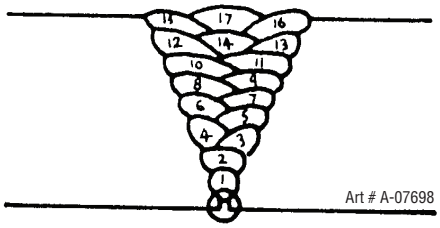


Figure 4-13: Weld build up sequence

Heavy plate will require several runs to complete the joint. After completing the first run, chip the slag out and clean the weld with a wire brush. It is important to do this to prevent slag being trapped by the second run. Subsequent runs are then deposited using either a weave technique or single beads laid down in the sequence shown in Figure 4-13. The width of weave should not be more than three times the core wire diameter of the electrode. When the joint is completely filled, the back is either machined, ground or gouged out to remove slag which may be trapped in the root, and to prepare a suitable joint for depositing the backing run. If a backing bar is used, it is not usually necessary to remove this, since it serves a similar purpose to the backing run in securing proper fusion at the root of the weld.

B. Fillet Welds

These are welds of approximately triangular cross-section made by depositing metal in the corner of two faces meeting at right angles. Refer to Figure 4-5.

A piece of angle iron is a suitable specimen with which to begin, or two lengths of strip steel may be tacked together at right angles. Using a 1/8" (3.2mm) E7014 electrode at 120 amps, position angle iron with one leg horizontal and the other vertical. This is known as a horizontal-vertical (HV) fillet. Strike the arc and immediately bring the electrode to a position perpendicular to the line of the fillet and about 45° from the vertical. Some electrodes require to be sloped about 20° away from the perpendicular position to prevent slag from running ahead of the weld. Refer to Figure 4-14. Do not attempt to build up much larger than 1/4" (6.4mm) width with a 1/8" (3.2mm) electrode, otherwise the weld metal tends to sag towards the base, and undercut forms on the vertical leg. Multi-runs can be made as shown in Figure 4-15. Weaving in HV fillet welds is undesirable.

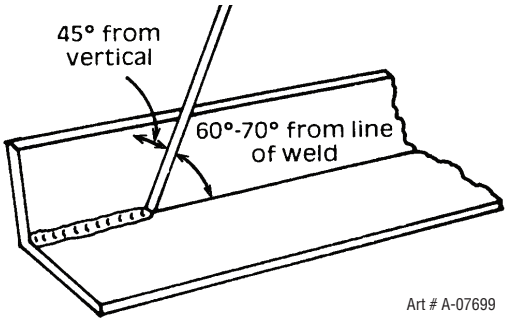


Figure 4-14: Electrode position for HV fillet weld

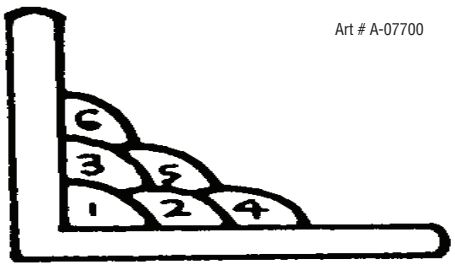


Figure 4-15: Multi-runs in HV fillet weld

C. Vertical Welds

1. Vertical Up

   Tack weld a three feet length of angle iron to your work bench in an upright position. Use a 1/8" (3.2mm) E7014 electrode and set the current at 120 amps. Make yourself comfortable on a seat in front of the job and strike the arc in the corner

of the fillet. The electrode needs to be about 10° from the horizontal to enable a good bead to be deposited. Refer Figure 4-16. Use a short arc, and do not attempt to weave on the first run. When the first run has been completed de-slag the weld deposit and begin the second run at the bottom. This time a slight weaving motion is necessary to cover the first run and obtain good fusion at the edges. At the completion of each side motion, pause for a moment to allow weld metal to build up at the edges, otherwise undercut will form and too much metal will accumulate in the centre of the weld. Figure 4-17 illustrates multi-run technique and Figure 4-18 shows the effects of pausing at the edge of weave and of weaving too rapidly.

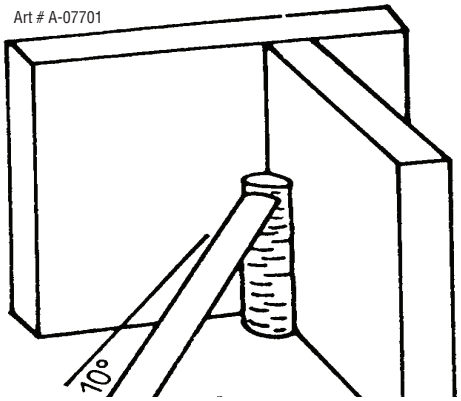


Figure 4-16: Single run vertical fillet weld

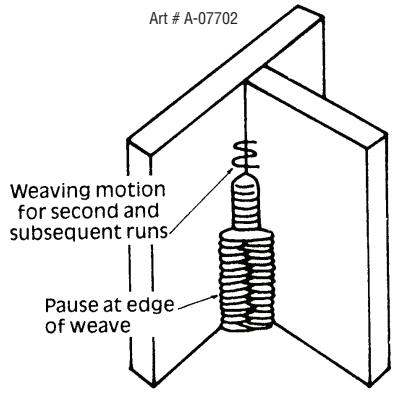


Figure 4-17: Multi run vertical fillet weld

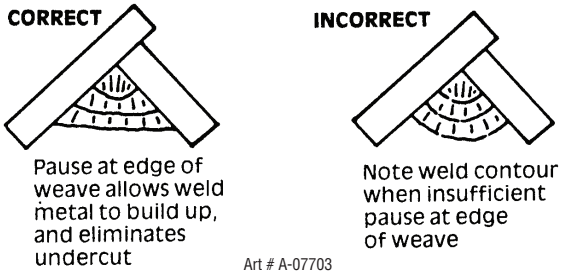


Figure 4-18: Examples of vertical fillet welds

2. Vertical Down

   The E7014 electrode makes welding in this position particularly easy. Use a 1/8" (3.2mm) electrode at 120 amps. The tip of the electrode is held in light contact with the work and the speed of downward travel is regulated so that the tip of the electrode just keeps ahead of the slag. The electrode should point upwards at an angle of about 45°.

3. Overhead Welds

   Apart from the rather awkward position necessary, overhead welding is not much more difficult that downhand welding. Set up a specimen for overhead welding by first tacking a length of angle iron at right angles to another piece of angle iron or a length of waste pipe. Then tack this to the work bench or hold in a vice so that the specimen is positioned in the overhead position as shown in the sketch. The electrode is held at 45° to the horizontal and tilted 10° in the line of travel (Figure 4-19). The tip of the electrode may be touched lightly on the metal, which helps to give a steady run. A weave technique is not advisable for overhead fillet welds. Use a 1/8" (3.2mm) E6012 electrode at 120 amps, and deposit the first run by simply drawing the electrode along at a steady rate. You will notice that the weld deposit is rather convex, due to the effect of gravity before the metal freezes.

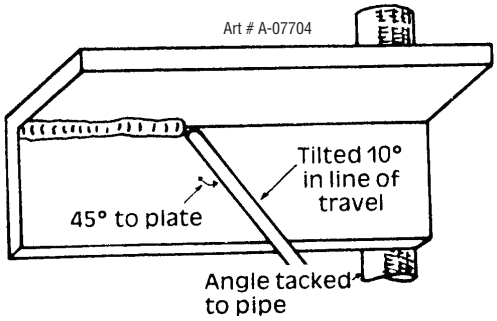


Figure 4-19: Overhead fillet weld

4.19 Distortion

Distortion in some degree is present in all forms of welding. In many cases it is so small that it is barely perceptible, but in other cases allowance has to be made before welding commences for the distortion that will subsequently occur. The study of distortion is so complex that only a brief outline can be attempted hear.

4.20 The Cause of Distortion

Distortion is cause by:

A. Contraction of Weld Metal:

Molten steel shrinks approximately 11 per cent in volume on cooling to room temperature. This means that a cube of molten metal would contract approximately 2.2 per cent in each of its three dimensions. In a welded joint, the metal becomes attached to the side of the joint and cannot contract freely. Therefore, cooling causes the weld metal to flow plastically, that is, the weld itself has to stretch if it is to overcome the effect of shrinking volume and still be attached to the edge of the joint. If the restraint is very great, as, for example, in a heavy section of plate, the weld metal may crack. Even in cases where the weld metal does not crack, there will still remain stresses “locked-up” in the structure. If the joint material is relatively weak, for example, a butt joint in 2.0mm sheet, the contracting weld metal may cause the sheet to become distorted.

B. Expansion and Contraction of Parent Metal in the Fusion Zone:

While welding is proceeding, a relatively small volume of the adjacent plate material is heated to a very high temperature and attempts to expand in all directions. It is able to do his freely at right angles to the surface of the plate (i.e., “through the weld”), but when it attempts to expand “across the weld” or “along the weld”, it meets considerable resistance, and to fulfil the desire for continued expansion, it has to deform plastically, that is, the metal adjacent to the weld is at a high temperature and hence rather soft, and, by expanding, pushes against the cooler, harder metal further away, and tends to bulge (or is “upset”). When the weld area begins to cool, the “upset” metal attempts to contract as much as it expanded, but, because it has been “upset”, it does not resume its former shape, and the contraction of the new shape exerts a strong pull on adjacent metal. Several things can then happen.

The metal in the weld area is stretched (plastic deformation), the job may be pulled out of shape by the powerful contraction stresses (distortion), or the weld may crack, in any case, there will remain “locked-up” stresses in the job. Figures 4-20 and 4- 21 illustrate how distortion is created.

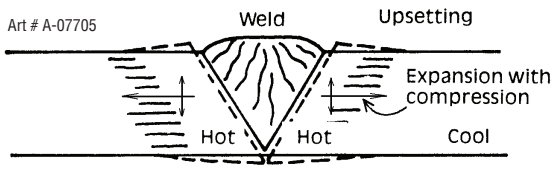


Figure 4-20: Parent metal expansion

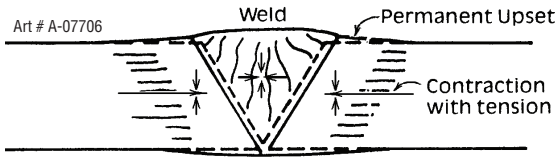


Figure 4-21: Parent metal contraction

4.21 Overcoming Distortion Effects

There are several methods of minimizing distortion effects.

A. Peening

This is done by hammering the weld while it is still hot. The weld metal is flattened slightly and because of this the tensile stresses are reduced a little. The effect of peening is relatively shallow, and is not advisable on the last layer.

B. Distribution of Stresses

Distortion may be reduced by selecting a welding sequence which will distribute the stresses suitably so that they tend to cancel each other out. See Figures 4-25 through 4-28 for various weld sequences. Choice of a suitable weld sequence is probably the most effective method of overcoming distortion, although an unsuitable sequence may exaggerate it. Simultaneous welding of both sides of a joint by two welders is often successful in eliminating distortion.

C. Restraint of Parts

Forcible restraint of the components being welded is often used to prevent distortion. Jigs, positions, and tack welds are methods employed with this in view.

D. Presetting

It is possible in some cases to tell from past experience or to find by trial and error (or less frequently, to calculate) how much distortion will take place in a given welded structure. By correct pre-setting of the components to be welded, constructional stresses can be made to pull the parts into correct alignment. A simple example is shown in Figure 4-22.

E. Preheating

Suitable preheating of parts of the structure other than the area to be welded can be sometimes used to reduce distortion. Figure 4-23 shows a simple application. By removing the heating source from b and c as soon as welding is completed, the sections b and c will contract at a similar rate, thus reducing distortion.

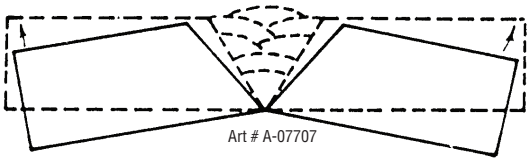
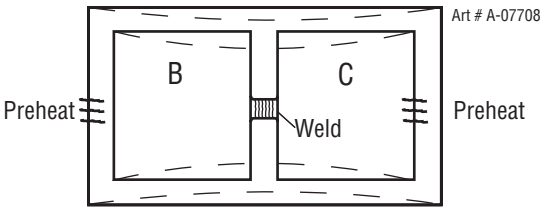


Figure 4-22: Principle of presetting



Dotted lines show effect if no preheat is used

Figure 4-23: Reduction of distortion by preheating

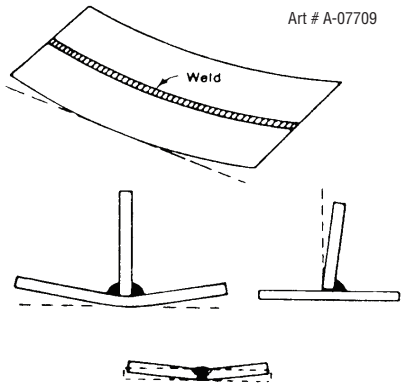


Figure 4-24: Examples of distortion

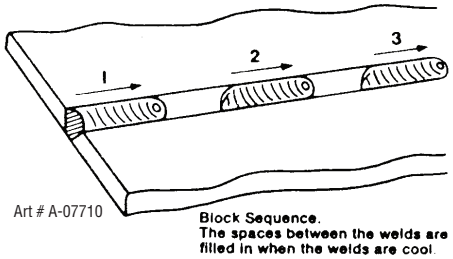


Figure 4-25: Welding sequence

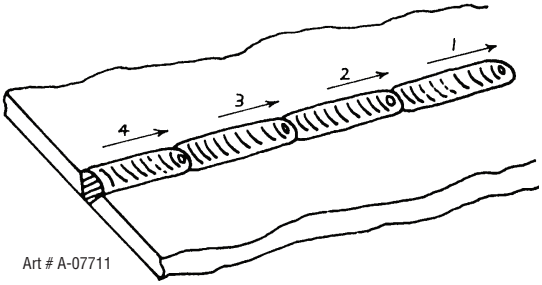


Figure 4-26: Step back sequence

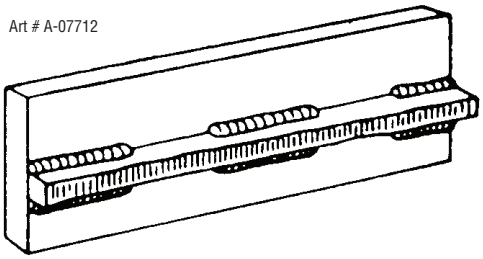


Figure 4-27: Chain intermittent welding

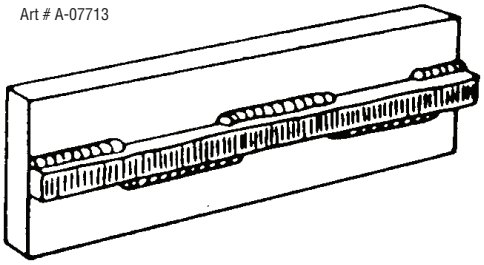


Figure 4-28: Staggered intermittent welding

SECTION 5: SERVICE

5.01 Maintenance and Inspection

The only routine maintenance required for the power supply is a thorough cleaning and inspection, with the frequency depending on the usage and the operating environment.

WARNING

There are extremely dangerous voltages and power levels present inside this product. Disconnect primary power at the source before opening the enclosure. Wait at least two minutes before opening the enclosure to allow the primary capacitors to discharge.

To clean the unit, open the enclosure and use a vacuum cleaner to remove any accumulated dirt and dust. The unit should also be wiped clean, if necessary; with solvents that are recommended for cleaning electrical apparatus.

CAUTION

Do not blow air into the power supply during cleaning. Blowing air into the unit can cause metal particles to interfere with sensitive electrical components and cause damage to the unit.

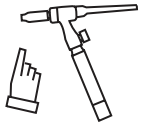
Warning!
Disconnect input power before maintaining.

Maintain more often if used under severe conditions

Each Use

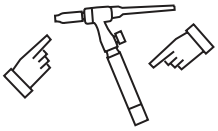
Visual check of regulator and pressure

Visual check of torch Consumable parts

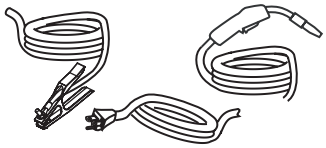


Weekly

Visually inspect the torch body and consumables

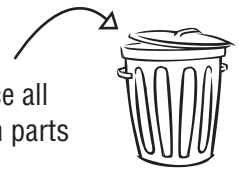


Visually inspect the cables and leads. Replace as needed

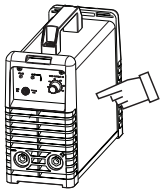


3 Months

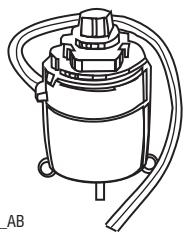
Replace all broken parts



Clean exterior of power supply

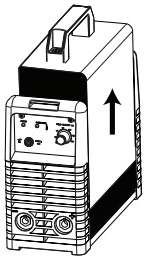


6 Months

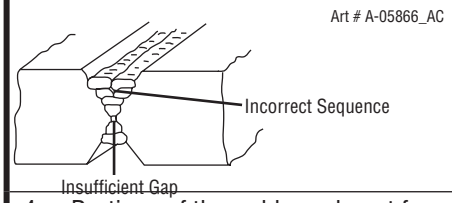
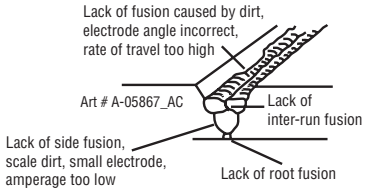
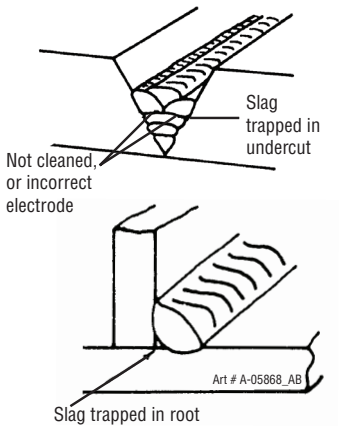


Art # A-08549_AB

Bring the unit to an authorized Thermal Arc Service Center to remove any accumulated dirt and dust from the interior. This may need to be done more frequently under exceptionally dirty conditions.



5.02 SMAW (Stick) Welding Problems

Description	Possible Cause	Remedy
1. Gas pockets or voids in weld metal (Porosity).	A. Electrodes are damp. B. Welding current is too high. C. Surface impurities such as oil, grease, paint, etc.	A. Dry electrodes before use. B. Reduce welding current. C. Clean joint before welding
2. Crack occurring in weld metal soon after solidification commences.	A. Rigidity of joint. B. Insufficient throat thickness. C. Cooling rate is too high.	A. Redesign to relieve weld joint of severe stresses or use crack resistance electrodes. B. Travel slightly slower to allow greater build up in throat. C. Preheat plate and cool slowly.
3. A gap is left by failure of the weld metal to fill the root of the weld. 	A. Welding current is too low. B. Electrode too large for joint. C. Insufficient gap. D. Incorrect sequence.	A. Increase welding current B. Use smaller diameter electrode. C. Allow wider gap. D. Use correct build-up sequence.
4. Portions of the weld run do not fuse to the surface of the metal or edge of the joint 	A. Small electrodes used on heavy cold plate. B. Welding current is too low. C. Wrong electrode angle. D. Travel speed of electrode is too high. E. Scale or dirt on joint surface.	A. Use larger electrodes and preheat the plate. B. Increase welding current C. Adjust angle so the welding arc is directed more into the base metal D. Reduce travel speed of electrode E. Clean surface before welding.
5. Non-metallic particles are trapped in the weld metal (slag inclusion). 	A. Non-metallic particles may be trapped in undercut from previous run. B. Joint preparation too restricted. C. Irregular deposits allow slag to be trapped. D. Lack of penetration with slag trapped beneath weld bead. E. Rust or mill scale is preventing full fusion. F. Wrong electrode for position in which welding is done.	A. If bad undercut is present, clean slag out and cover with a run from a smaller diameter electrode. B. Allow for adequate penetration and room for cleaning out the slag. C. If very bad, chip or grind out irregularities. D. Use smaller electrode with sufficient current to give adequate penetration. Use suitable tools to remove all slag from corners. E. Clean joint before welding. F. Use electrodes designed for position in which welding is done, otherwise proper control of slag is difficult.

5.03 GTAW (Lift TIG) Welding Problems

Weld quality is dependent on the selection of the correct consumables, maintenance of equipment and proper welding technique.

Description	Possible Cause	Remedy
1. Excessive beard build-up or poor penetration or poor fusion at edges of weld.	Welding current is too low	Increase weld current and/or change joint preparation.
2. Weld bead too wide and flat or undercut at edges of weld or excessive burn through.	Welding current is too high.	Decrease welding current.
3. Weld bead too small or insufficient penetration or ripples in bead are widely spaced apart.	Travel speed too fast.	Reduce travel speed.
4. Weld bead too wide or excessive bead build up or excessive penetration in butt joint.	Travel speed is too slow.	Increase travel speed.
5. Uneven leg length in fillet joint.	Wrong placement of filler rod.	Re-position filler rod.
6. Electrode melts when arc is struck.	Electrode is connected to the "+" Positive Output Terminal.	Connect the electrode to the "-" Negative Output Terminal.
7. Dirty weld pool.	A. Electrode contaminated through contact with work piece or filler rod material. B. Gas contaminated with air.	A. Clean the electrode by grinding contaminates off. B. Check gas lines for cuts and loose fitting or change gas cylinder.
8. Poor weld finish.	Inadequate shielding gas.	Increase gas flow or check gas line for problems
9. Arc flutters during TIG welding.	Tungsten electrode is too large for the welding current.	Select the right size electrode. Refer to section Tungsten Electrode Current Ranges.
10. Welding arc cannot be established.	A. Work clamp is not connected to the work piece or the work/torch leads are not connected to the correct welding terminals. B. Torch lead is disconnected. C. Gas flow incorrectly set, cylinder empty or the torch valve is off.	A. Connect the work clamp to the work piece or connect the work/torch leads to the correct welding terminals. B. Connect it to the "-" Negative Output Terminal. C. Select the right flow rate, change cylinder or turn torch valve on.
11. Electrode melts or oxidizes when an arc is struck.	A. No gas is flowing to welding region. B. Torch is clogged with dust. C. Gas hose is cut. D. Gas passage contains impurities. E. Gas regulator turned off. F. Torch valve is turned off. G. The electrode is too small for the welding current.	A. Check the gas lines for kinks or breaks or cylinder contains gas. B. Clean torch. C. Replace gas hose. D. Disconnect gas hose from torch then raise gas pressure and blow out impurities. E. Turn on. F. Turn on. G. Increase electrode diameter or reduce the welding current.

GTAW (Lift TIG) Welding Problems (Con-

Description	Possible Cause	Remedy
12. Arc start is not smooth.	A. Tungsten electrode is too large for the welding current. B. The wrong electrode is being used for the welding job. C. Gas flow rate is too high. D. Incorrect shield gas is being used. E. Poor work clamp connection to work piece.	A. Refer to section Tungsten Electrode Current Ranges for the correct size. B. Refer to section Tungsten Electrode Types for the correct electrode type. C. Select the correct flow rate for the welding job. D. Use 100% argon for TIG welding. E. Improve connection to work piece.

WARNING

There are extremely dangerous voltages and power levels present inside this product. Do not attempt to repair unless you are an Accredited Thermal Arc Service Agent and you have had training in power measurements and troubleshooting techniques. If major complex subassemblies are faulty, then the Welding Power Source must be returned to an Accredited Thermal Arc Service Agent for repair.

5.04 Power Source Problems

Description	Possible Cause	Remedy
1. The welding arc cannot be established.	A. The Primary supply voltage has not been switched ON. B. The Welding Power Source switch is switched OFF. C. Loose connections internally.	A. Switch ON the Primary supply voltage. B. Switch ON the Welding Power Source. C. Have an Accredited Thermal Arc Service Provider repair the connection.
2. The welding arc cannot be established when the Over Heat Indicator is illuminated	The machines duty cycle has been exceeded	Wait for the Over Heat Indicator to extinguish before resuming welding
3. Maximum output welding current cannot be achieved with nominal Mains supply voltage.	Defective control circuit	Have an Accredited Thermal Arc Service Provider inspect then repair the welder.
4. Welding current reduces when welding.	Poor work lead connection to the work piece.	Ensure that the work lead has a positive electrical connection to the work piece.
5. Circuit breaker (or fuse) trips during welding.	The circuit breaker (or fuse) is under size.	The recommended circuit breaker (or fuse) size is 20 amp. An individual branch circuit capable of carrying 20 amperes and protected by fuses or circuit breaker is recommended for this application.

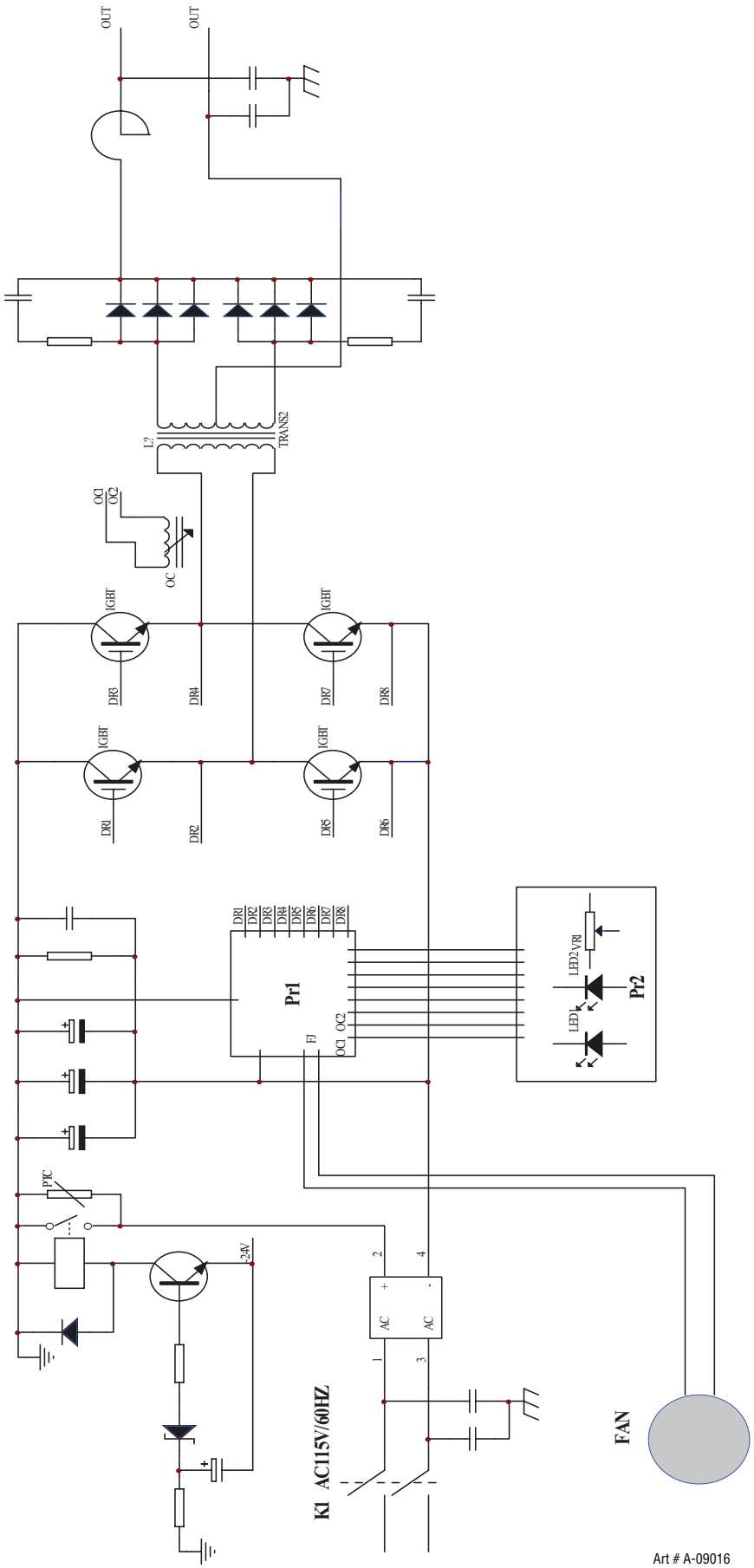
APPENDIX 1: REPLACEMENT PARTS

Description	Part No.
Case Toolbox, 95S	W4012801
Fan, 24V DC, 95S	W7003004
Rectifier Bridge, 700V, 50A, 95S	W7003010
Current Sensor, 95S **CSA**	W7003077
Thermistor, 95S	W7003016
Terminal, Output, 95S	W7003019
Handle, 95S **CSA**	W7003078
Knob, Control, Red, 20 OD x 6 ID	W7003079
Panel, Base, 95S **CSA**	W7003080
Panel, Cover, 95S	W7003043
Panel, Front, 95S **CSA**	W7003081
Panel, Rear, 95S **CSA**	W7003082
PCB, Control, 95S	W7003046
PCB, Front Control, 95S **CSA**	W7003083
PCB, Power, 95S **CSA**	W7003084
Strap, Shoulder, 95S	W7003049
Switch, On/Off, 95S	W7003050

APPENDIX 2: OPTIONS AND ACCESSORIES

Description	Part Number
17V style TIG Torch with 3m lead, gas valve, 25mm dinse connection and accessory kit	W4012500
Argon Shielding Gas Regulator with 5/8"-18 UNF Hose Connection	600300
Power Adapter-115V,20A Socket to 15A Plug	W4013300
USA Graphics Auto-Darkening welding helmet, spare cover lens and operating manual	W4011700
Canadian Graphics Auto-Darkening welding helmet, spare cover lens and operating manual	W4011800
Claret Color Auto-Darkening welding helmet, spare cover lens and operating manual	W4011900
Black Graphics Auto-Darkening welding helmet, spare cover lens and operating manual	W4012000

APPENDIX 3: SYSTEM SCHEMATIC



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LIMITED WARRANTY

This information applies to Thermal Arc products that were purchased in the USA and Canada.

November 2007

LIMITED WARRANTY: Thermal Arc®, Inc., A Thermadyne Company ("Thermal Arc"), warrants to customers of authorized distributors ("Purchaser") that its products will be free of defects in workmanship or material. Should any failure to conform to this warranty appear within the warranty period stated below, Thermal Arc shall, upon notification thereof and substantiation that the product has been stored, installed, operated, and maintained in accordance with Thermal Arc's specifications, instructions, recommendations and recognized standard industry practice, and not subject to misuse, repair, neglect, alteration, or damage, correct such defects by suitable repair or replacement, at Thermal Arc's sole option, of any components or parts of the product determined by Thermal Arc to be defective.

This warranty is exclusive and in lieu of any warranty of merchantability, fitness for any particular purpose, or other warranty of quality, whether express, implied, or statutory.

Limitation of liability: Thermal Arc shall not under any circumstances be liable for special, indirect, incidental, or consequential damages, including but not limited to lost profits and business interruption. The remedies of the purchaser set forth herein are exclusive, and the liability of Thermal Arc with respect to any contract, or anything done in connection therewith such as the performance or breach thereof, or from the manufacture, sale, delivery, resale, or use of any goods covered by or furnished by Thermal Arc, whether arising out of contract, tort, including negligence or strict liability, or under any warranty, or otherwise, shall not exceed the price of the goods upon which such liability is based.

No employee, agent, or representative of Thermal Arc is authorized to change this warranty in any way or grant any other warranty, and Thermal Arc shall not be bound by any such attempt. Correction of non-conformities, in the manner and time provided herein, constitutes fulfillment of thermal's obligations to purchaser with respect to the product.

This warranty is void, and seller bears no liability hereunder, if purchaser used replacement parts or accessories which, in Thermal Arc's sole judgment, impaired the safety or performance of any Thermal Arc product. Purchaser's rights under this warranty are void if the product is sold to purchaser by unauthorized persons.

The warranty is effective for the time stated below beginning on the date that the authorized distributor delivers the products to the Purchaser. Notwithstanding the foregoing, in no event shall the warranty period extend more than the time stated plus one year from the date Thermal Arc delivered the product to the authorized distributor.

Warranty repairs or replacement claims under this limited warranty must be submitted to Thermal Arc via an authorized Thermal Arc repair facility within thirty (30) days of purchaser's discovery of any defect. Thermal Arc shall pay no transportation costs of any kind under this warranty. Transportation charges to send products to an authorized warranty repair facility shall be the responsibility of the Purchaser. All returned goods shall be at the Purchaser's risk and expense. This warranty dated July 1st 2007 supersedes all previous Thermal Arc warranties. Thermal Arc® is a Registered Trademark of Thermal Arc, Inc.

WARRANTY SCHEDULE

This information applies to Thermal Arc products that were purchased in the USA and Canada.

January 2009

SAFETY EQUIPMENT	WARRANTY PERIOD	LABOR
Auto-Darkening Welding Helmet (Electronic Lens)	2 years	2 years
Harness Assembly	1 month	1 month
ENGINE DRIVEN WELDERS	**WARRANTY PERIOD**	**LABOR**
Scout, Raider, Explorer		
Original Main Power Stators and Inductors	3 years	3 years
Original Main Power Rectifiers, Control P.C. Boards	3 years	3 years
All other original circuits and components including, but not limited to, relays, switches, contactors, solenoids, fans, power switch semi-conductors	1 year	1 year
Engines and associated components are NOT warranted by Thermal Arc, although most are warranted by the engine	See the Engine Manufactures' Warranty for Details	
GMAW/FCAW (MIG) WELDING EQUIPMENT	**WARRANTY PERIOD**	**LABOR**
Firepower FP-95, FP-125, FP-135, FP-165 Fabricator 140, 180, 190, 210, 251, 281; Fabstar 4030; PowerMaster 350, 350P, 500, 500P, 320SP; 400SP; 500SP; Excelarc 6045. Wire Feeders; Ultrafeed, Portafeed		
Original Main Power Transformer and Inductor	5 years	3 years
Original Main Power Rectifiers, Control P.C. Boards, power switch semi-conductors	3 years	3 years
All other original circuits and components including, but not limited to, relays, switches, contactors, solenoids, fans, electric motors.	1 year	1 year
GTAW (TIG) & MULTI-PROCESS INVERTER WELDING EQUIPMENT	**WARRANTY PERIOD**	**LABOR**
160TS, 300TS, 400TS, 185AC/DC, 200AC/DC, 300AC/DC, 400MST, 300MST, 400MSTP		
Original Main Power Magnetics	5 years	3 years
Original Main Power Rectifiers, Control P.C. Boards, power switch semi-conductors	3 years	3 years
All other original circuits and components including, but not limited to, relays, switches, contactors, solenoids, fans, electric motors.	1 year	1 year
PLASMA WELDING EQUIPMENT	**WARRANTY PERIOD**	**LABOR**
Ultima 150		
Original Main Power Magnetics	5 years	3 years
Original Main Power Rectifiers, Control P.C. Boards, power switch semi-conductors	3 years	3 years
Welding Console, Weld Controller, Weld Timer	3 years	3 years
All other original circuits and components including, but not limited to, relays, switches, contactors, solenoids, fans, electric motors, Coolant Recirculator.	1 year	1 year
SMAW (Stick) WELDING EQUIPMENT	**WARRANTY PERIOD**	**LABOR**
Thermal Arc 95 S		
Original Main Power Magnetics	1 year	1 year
Original Main Power Rectifiers, Control P.C. Boards	1 year	1 year
All other original circuits and components including, but not limited to, relays, switches, contactors, solenoids, fans	1 year	1 year
160S, 300S, 400S		
Original Main Power Magnetics	5 years	3 years
Original Main Power Rectifiers, Control P.C. Boards	3 years	3 years
All other original circuits and components including, but not limited to, relays, switches, contactors, solenoids, fans, power switch semi-conductors	1 year	1 year
GENERAL ARC EQUIPMENT	**WARRANTY PERIOD**	**LABOR**
Water Recirculators	1 year	1 year
Plasma Welding Torches	180 days	180 days
Gas Regulators (Supplied with power sources)	180 days	Nil
MIG and TIG Torches (Supplied with power sources)	90 days	Nil
Replacement repair parts	90 days	Nil
MIG, TIG and Plasma welding torch consumable items	Nil	Nil

U.S. Customer Care: 800-426-1888 / FAX 800-535-0557 • Canada Customer Care: 905-827-4515 / FAX 800-588-1714
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Miami, FL USA
Sales Office, Latin America
Ph: 1-954-727-8371
Fax: 1-954-727-8376

Oakville, Ontario, Canada
Canada Customer Care
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